

AVIATION WEEK

NOV. 1, 1954

50 CENTS

A MCGRAW-HILL PUBLICATION



S2F

From tin fish to censored

The TBF Avenger was built to deliver tin fish to surface ships. This she did with alacrity during World War II. She also corked harbors with mines, sought subs and sank 'em. The new S2F is more a submarine specialist. Filled with electronic gear that detects, plots, and pin-points an unseen sub, she can drop a *censored* charge

that will guarantee "point of no return" for the sub. The S2F is the latest of a long line of highly effective aircraft designed and built for the U. S. Navy.



GRUMMAN AIRCRAFT ENGINEERING CORPORATION
BETHPAGE • LONG ISLAND • NEW YORK

DESIGNERS AND BUILDERS ALSO OF THE NEW SUPERSONIC TIGER, ALBATROSS
AMPHIBIANS, METAL BOATS, AND AEROBILT TRUCK BODIES



AVENGER

SUNDSTRAND AVIATION DOUBLES PRODUCTION CAPACITY



Sundstrand Aviation is now the sole occupant of a 250,000 square-foot facility devoted to production of Sundstrand Constant Speed Drives for the aircraft industry. The move, which doubles production capacity, reflects Sundstrand Aviation's continuing policy of providing facilities to meet current commitments, as well as to anticipate future demands of the Air Force, the Bureau of Aeronautics, and engine and airframe manufacturers for the present constant speed drive. It comes hard on the heels of the announcement made earlier this year of Sundstrand Aviation as a separate division of Sundstrand Machine Tool Co. And it is to be followed by other expansion moves, now in planning stages, which will provide additional facilities to meet the ever increasing demand for Sundstrand Constant Speed Drives.

SUNDSTRAND AVIATION

Division of Sundstrand Machine Tool Company, ROCKFORD, ILLINOIS • Western District Office: Hawthorne, California

CONSTANT SPEED DRIVES • AIRCRAFT ACCESSORIES

RESEARCH DEPT.

B.F. Goodrich

FIRST IN RUBBER



We're for never blowing bubbles

THE MINUTE TYPE CANOPY on the new Martin B-57B light bomber had to be safely pressurized at altitudes of 8 miles and higher. Ordinary inflatable seals however, that bubble and collapse might blow out from the effect of high pressure inside the canopy and low pressure on the outside.

B. F. Goodrich engineers had a ready-made answer to the problem—their inflatable strip seal. It has a U-shaped metal rubbery base and a rubber and fabric diaphragm sewed inside the base. When inflated, this diaphragm simply lifts to seal effectively. Low inflation

pressure gives full expansion with very little or no stretch. Of course, low stretch means less stress. It works like blowing up a paper bag so that dangerous stretching, like blowing up a toy balloon, is eliminated.

The new inflatable strip seal works almost instantly. Even at minus 65°, it inflates with approximately the same pressure that ordinary seals needed at room temperature. There are other advantages. In the unusual case of a corner it seals and seals quickly. Sealing wear and scuffing are minimized because of high durometer when seal is deflated.

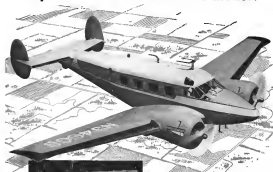
The new B. F. Goodrich seal is now in use on more than a dozen makes of planes, including jets in fighters and bombers like the F-100 and B-57.

Other B. F. Goodrich products for aviation are tires, wheels, landing flaps, brake linings, fuel cells, Kevlar® hose, cabin accessories. The B. F. Goodrich Company, Aeronautical Sales, Akron, Ohio.

B.F. Goodrich

FIRST IN RUBBER

New 8-Place Beechcraft "Super 18" outperforms famous wartime model!



The new higher Beechcraft "Super 18" cruises at 253 mph, has a range of 1,415 miles.

Beech Aircraft selects Macwhythe "Hi-Fatigue" Cable for the "Super 18's" controls



Macwhythe "Hi-Fatigue" cables are being installed and are already in use in this new design aircraft. Photo was taken at first flight test.

The new Beechcraft "Super 18" Executive Plane boasts many new improvements over the Model 18, the predecessor that saw so much wartime army and navy service. Controls on each three *Hi-Fatigue* models are operated with Macwhythe "Hi-Fatigue" specially control cable. The 8-place, four-engine executive aircraft has a maximum speed of 254 mph, a cruising speed of 215 mph, and a range of 1,415 miles. The "Super 18" boasts a higher service ceiling than the earlier model, a lower rate of climb and single engine performance, and a greater gross

weight of 9500 lbs.

The 350-hp. Duxton six-cylinder gas engine gives the "Super 18" a better climb, but the installation of pre-type exhaust stacks, redesigned wing tips, and other aerodynamic modifications boost the performance without cost of extra fuel.

The sole use of Macwhythe "Hi-Fatigue" Cable by Beech Aircraft and other leaders in the aircraft industry is a testimony to its long record of safe and dependable service. Write for more information on Macwhythe Aircraft products: Speed Control A-2.

MACWHYTE

CABLE TERMINALS KISLINGHOLM TR-8005

Macwhythe Company, 8605 Fairview Avenue, Kansas, Wichita, Manufacturers of "Hi-Fatigue" Aircraft Cable, Side Lock Cable, Terminal-Cable Assemblies, In-Situ-Resin, Wire Rope Repair-Resin, Silvermetal, Stainless Steel and Monel Metal Wire Rope (3160) available.

"Hi-Fatigue" is a registered trademark. Member AIDMA and AIAA.



NEWS DIGEST

Domestic

Spook XB-62. Northrop Aircraft's long-range pistonless bomber, in showing "stealth" program" in development, the builder reports. Northrop also says it is carrying out a joint proving program with the Air Force at USAF's Missile Test Center at Goose, Fla.

Prototype F9F-6. Vought crashed Oct. 19 near Grinnell Aircraft Engineering Corp.'s Pomona, N. Y., plant during an unsuccessful attempt to make the field after a descent at about 5,000 ft. The Navy test pilot was injured but walked away from the crash. Grinnell's second F9F-6 now is flying.

Testpilot Charles R. Y. 2. testpilot crashed Oct. 22 at San Diego, leaving 1 hr. 25 min.

Dr. George T. Baker, professor of transportation at the Harvard Graduate School of Business Administration, was named member of Civil Aeronautics Board and vice president of the Federal Aviation Commission in 1947, the first president of Transportation Association of America. He succeeds Frank C. Roth, who retired.

Skanky Alford's new Army contract for 15-17 cargo helicopters (Aviation Week Oct. 18, p. 34) worth \$64 million.

Five related options will be made before the 1954 order new contracts awarded to Western Electric Co., General Motors Corp.'s A.C. Spunk Plug Division and Sperry Gyroscope Co. The awards Western Electric, \$24 million, A.C. Spunk Plug, \$17 million, Sperry, \$17 million.

Financial

Douglas Aircraft Corp., Santa Monica, Calif., reports net earnings of \$25,190,796 for the first nine months of fiscal 1954, more than doubling the \$15,315,375 net for the same period last year. Net sales totaled \$69,512,840, compared with \$61,258,925. Backlog Sept. 30: \$4,835,083,510.

Glenn L. Martin Co., Baltimore, had a net income of \$14,580,087 for the first nine months of this year, compared with \$7,365,847 for the same period at 1953. Sales climbed to \$187,735,497 from \$116,994,076. The company has declared its first dividend in eight years \$1 plus a 10% bonus on stock dividend, payable Dec. 15 to holders of record Nov. 8.

American Airlines' net profit for the



Piper Unveils Business Planes for 1955

Piper Aircraft Corp. is introducing an new type of engine—the 150hp Lycoming—on all three of its business planes for 1955. The new models, shown in relation to 9,000 ft. are (top to bottom): Twin-engine Apache, Tri-Pacer and Super Cub. The latter was previously had the 150hp Lycoming. Because of prepayment demand for the Tri-Pacer, the company has discontinued production of its new ship, the Apache. Apache basic price remains at \$15,500, the Tri-Pacer and Super Cub each up to \$10,000 and \$14,445, respectively, because of the more powerful engine.

first nine months of 1954 totaled \$5,485,000, dropping from \$10,997,000 for the first three quarters of 1953. AA blames the loss in part on the 24-day "pilot" strike last August (Aviation Week Aug. 18, p. 35). Revenue was \$15,450,902, compared with \$15,548,204.

Northrop Aircraft, Inc., Hawthorne, Calif., had a consolidated net income of \$4,535,387 for the fiscal year ended July 31, compared with \$3,130,159. Sales and other revenues dropped to \$171,668,141 in fiscal 1954 from \$181,198,817 last year. Consolidated backlog July 31: approximately \$342 million.

General Aircraft Co., Wichita, reports net of \$45.8 million for fiscal 1954, an increase of \$1.5 million over 1953. Backlog Sept. 30: \$35 million. The company has declared an extra 25-cent dividend plus a regular semiannual payment of 25 cents, payable Dec. 15 and 15 respectively to stockholders of record Dec. 7.

International

Vickers-Armstrong's has agreed, at the suggestion of British Air Registration Board, to conduct coordination work between and presentation tests to the

machines on a Vickers test program. Company is building its own test track and will have complete costs—including loss of one Vickers. The action results from the Coast Court of inquiry for p. 16).

Two-engine Vickers Viscount crash landed at Bournemouth, Surrey, last week after a short test run and will have complete costs—including loss of one Vickers. The action results from the Coast Court of inquiry for p. 16).

British government, according to Press reports, has offered Air France and UAT 12 Vickers Viscounts plus spare in return for their Coast 1. Each aircraft originally had three Coast 1.

Convair D-5A crashed Oct. 21 in Rio de Janeiro's Guanabara Bay off the Santa's Dumont Airport, and all 32 persons aboard were rescued.

Fraser Cresswell, 74, business chief pilot and helicopter consultant for Sabena Belgium airline, died Oct. 21 in Brussels.



50th ANNIVERSARY POWERED CARRIAGES

50th ANNIVERSARY POWERED FLIGHT

Some of the great names in the Motor Car Industry recently celebrated their 50th Anniversary and now the Aircraft Industry relates its dramatic and enchanting history of Powered Flight over a fifty-year period. • The astounding growth of these two industries would have been impossible without Forgings which are used wherever maximum strength with minimum weight is essential. • Wyman-Gordon has been privileged to serve these industries from their beginning... has kept abreast of progress and has pioneered many advancements in Forging and Heat Treating techniques and in quality control. • There is no limit here for a Forging - and in a Forging there is no substitute for Wyman-Gordon skill and experience.

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DOUGLAS DC-7C is shown here in Pan American World Airways markings prepared by Douglas, FMA, SAS and Swissair selected clients.

DC-7C Challenges Turbine Transports

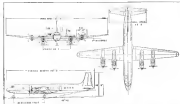
By David A. Anderson

Santa Monica, Calif.—Douglas Aircraft Co.'s DC-7C has long a performance challenge to other transport manufacturers and to the turbine industry.

Guaranteed performance figures for the 7C have forced airline operators to take another look at data that require search for the next decade, have dared manufacturers of turboprop and turboprop transports to match its economy and save its point-to-point speed, and have forced gauding calculations from the competition, with the exception that, of course, the competition has an answer coming right by.

With a solid order of 25 airplanes to lead off the production line, the Douglas company is offering the Seven Seas to other domestic and foreign operators for deliveries beginning in about three years.

First to buy was Pan American World Airways, with an order for 15 airplanes. Scandinavian Airlines System announced next its order for eight, closely followed by a Swissair announcement of the purchase of two DC-7Cs.

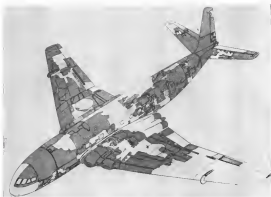


SEVEN SEAS thus view shows basic turbine design from earlier DC-7 series. Span and length necessary plus more power units more payload, better operating economy.

Cost Plus-Five has \$24-million investment per copy, the airline operator will get a 52-passenger airplane that will fly the Atlantic seaboard, either way, year-round. He will get an airplane with an easy operating range of

4,000 mi and wide possible operation up to 4,800 mi. He will be able to operate across the Pole to Europe, by the Pacific seaboard, make coach runs from Chicago to Europe via Tokyo.

He will get an airplane that will be



RECOVERED WRECKAGE of Comet 1 (shaded area) was big factor in determining sequence and pattern of accident failure.

Comet Findings May Upset Design Concepts

By Scribner Bell
(McGraw-Hill World News)

London-Release as detail of a court of inquiry of exactly why and how the British Overseas Airways Corp. de-

stroyed Comet 1 blew up at Elba December 29, p. 17) raises a whole new series of questions for British aerospace manufacturers.

These questions involve new requirements for testing pressurized com-

mercial airplanes before certification, more elaborate post-certification checks, undoubtedly new and more rigid structural standards, and the thorough implementation of stress manufacturing techniques.

New Fatigue Problems. All are questions that won't be answered not only in Britain, but probably in the U.S. as well. For the construction of the heavy stresses imposed by pressurization with wing loads translated through the fuselage to fatigue-prone joints brings to light many new problems in connection with fatigue.

It is obvious now that these problems were introduced partly by the Comet's square windows. But, except by total ban to destruction, there is no way of telling whether standard aeronautical engineering practice in the case of round or oval windows will provide a sufficient margin of safety for other commercial aircraft.

It is not the ultimate strength of a structure relative to the mission possible load to which it may be subjected that is in question. It is precisely the matter of fatigue-life to lengthen

fatigue life and if possible, how to spot the outstanding fatigue before it is too late.

Pressure Tests for All-Though. British Air Registration Board hasn't yet put into operation a detailed program for coping with these problems, it seems likely that the Britains, Viscount, Fokker Friendship, Handley Page Herald and any other passenger commercial aircraft that waste British certification will have to undergo the same water tests the Comet has undergone at Farnborough.

The Royal Aircraft Establishment already has told the British aircraft industry that the special rig built for testing the Comet will be made available. As a matter of fact, the only point that seems to remain in dispute is who is going to pay for the tests which, among other things, involve the testing to destruction of a production model of the aircraft to be certified.

With reference to the Viscount, these



FUSelage FAILURE of submerged Comet (D-ALSV) occurred at corner of forward escape hatch on port side (spiral through skin to fuselage frame).

General View Looking Forward



ESCAPE HATCH failure is shown in this general view of port side of lost Comet. Note size of spiral through fuselage frame (right).

General View Looking Aft



SKIN TEARING resulting from failure around escape hatch of submerged Comet viewed from heavy port pattern at base.



SUBMERGED COMET was tested under simulated cabin pressurization and sea loads at the 250,000-gal water tank. External joints applied light loads to wings.



CONJUNCTION DETAIL, at aft of hatch, at forward escape hatch shows single transverse joint in corner of failure.



FAILURE CLOSURE of forward corner of hatch framing sheet skin tearing and fuselage ring showed from explosive blowout.

some on likelihood of growing it, while such tests are being carried out at RAE. Came-Out of RAE director Sir Arnold Hall's testimony comes the exact cause of the Elio crash and possibly the precise point of the initial failure: it was a high stress of fatigue failure which seems to have started on the edge of a bevelled rivet hole under the main cabin floor plate, in the rear starboard corner of the rear ADF window (which bears the ADF antenna). The data sets at this point in 32 pages (0-025 in thick). The reinforcing plate is of the same grade.

With reference to the Comet F's crash, Sir Arnold described it as having a low fatigue life. He notes that the first Comet fatigue failed after a total of 5,800 hr. (which flight time plus maintenance flight time), or had 5.4 times the fatigue life of the Naples Comet and 2.4 times that of Elio Comet.

He says that in all other respects "accrual" range when talking about fatigue life, which should run from one third the average to three times the average or a 9:1 ratio.

Mr. Gossamer also pointed out that even though Fairchild's efforts to simulate service flight by applying both lift and gust wing loads along with pressurization loads were quite realistic, they did not take into account vibrations from the engines, condensation and expansion of the skin due to temperature changes, applied air and landing loads and the small variations in the cyclic pressure.

All these things would lead to reduce fatigue life. Even based solely on the Fairchild tests, Sir Arnold says he would not have been able to guarantee the Comet's safe lifetime up to the 2,794 hr. logged by the Naples Comet. He says the above 9:1 ratio to show why. On this reasoning the Comet would not be safe beyond 1,800 hr.

Sir Arnold figures Elio and Naples Comets were on the low side of the scatter in expected fatigue life—the weakest links—and thus went first. • **Conservative**—It would seem fairly obvious that the three or four maximum intact Comet 1s will never return to commercial service again. This seems a threatened not only by the passenger cabin, strengthening of which would take a great deal of the aircraft's margin payload away and cost a fair bit, but by the other faults RAE found that will have been backed over repeatedly during testings and cross-examinations. First the Comet 1 will need considerable modification in order to bring its life up to safe standards. It essentially is a Comet 1 built the same way to the same standards. The Comet 3, as well as the second generation, appear to be basically a lightweight Comet 2 or 1.

• **Manufacturing**—Comet-Conservative has been spent in the court dis-

cussing what is the only way to be assured to a manufacturing method. However, it seems virtually certain the courts examining the fault-finding.

For not only did Sir Arnold trace the initial Elio failure to such an interest, but on supposing the wreckage of the Elio Comet, it was found that under the wing-folding plate of the starboard front corner of the rear ADF window a crack had developed during manufacture and, in accordance with standard engineering practice, had been drilled.

The apparently contributed nothing to the Elio crash. However, similar manufacturing cracks have been found in the rear Comet, and in at least one instance fatigue crack—beyond the drill hole. Sir Arnold noted that even though these cracks did not cause a failure they were indicative of a crack which could produce a fatigue crack—which inspection would not avoid, but which accelerate a fatigue failure.

For example, there is no way of knowing for sure if this might not have been the case in the initial failure of the Elio Comet.

To propose a rivet hole for counter-sinking, de Havilland drills it out, actually cuts over the metal to make the level. This method in comparison to "spot-dimpling" used by some other manufacturers where the level is pressed into shape by a spinning force, but where no metal is cut away.

• **Other Troubles**—Other troubles found with Comet models:

• Possibility of damage to the wing under severe icing conditions. 350- to 320 psi a minute and the lowest to be sustainable. In the case overloading both rapped the boom and could cut the wing strength by as much as a fifth. This value is liable to be severe, and pulling the value where this does not necessarily break it loose.

• Using radioactive tracers, RAE determined that fuel from the tank venting system got inside the wing along the gap to within 2 or 3 in. of the tip pape shroud—which reached temperatures of 570C. This compares to a minimum ignition temperature for kerosene under certain conditions of 290C. In this case there are no fire warning or fire fighting devices.

• The wing has a relatively low resistance to fatigue. At a number of stages during the RAE water tank tests, sensors were applied to the bevelled screw and joint bolts where the wheel wells and finally cracking in water tank during the top wing surface.

Tests made in this tank on the fuselage and wings included 157,600 test point load cycles, or 4,790 simulated flights, added to estimated 30,000 service cycles in 1,670 actual flight

• **Chase Bill to Joe-Nose**—None of these last three things apparently contributed to either crash. But as picked up after Naples had reached the same position as did those from Elio, indicating previous cabin failure of much the same pattern.

The Comet's tail stood up quite well under test and seems to have been one of the most trouble-free components, though on ultimate strength tests, there seems to be some doubt as to whether the vertical rib-strengthening meets minimum ADR requirements.

Chief engine designer given by E. S. Monds, de Havilland Engine Co. chief engineer, and mentioned in by Frank Longley, shows the bird-like hook up in the result of airframe and had nothing to do with the crash. There were two big cracks at failure. First came from sudden violent gyroscopic movement as the craft rolled over during cabin failure which broke the No. 2 engine shaft with the loss of the turbine wheel at the radius of the killer between the shaft and flange (where the wheel is attached).

Severe static damage resulted in all engines upon impact with the sea when numerous cracks were caused at the consequence of the accident, to crack in the same way.

• **No Engine Wrecks**—ADR laboratory tests showed that engine velocity needed to cause gyroscopic loading of the kind as was there evident, at about 160 deg per second. When the No. 2 engine turbine wheel went on the Elio crash, it went down as a result of failure but the whole wheel not coming a real hole as the turbine wheel shroud on its way out.

Chaps in state Miles in the engine resulted from degradation of the shaft. Engines actually did not catch fire at any time though they were in the presence of severe fire.

Other points of interest:

- The shrapnel may get slightly confused by possible evidence from Public air craft designer James H. Holsopple of Johns Hopkins, Ltd., London, who says Sir Arnold Hall is on the wrong track. Holsopple indicates he knows what is wrong with the Comet's 1st hour's apparent yet, but has sent a letter to Commissioner Lord Coburn and may be called.

Holsopple, who studied aviation since 1916, Wingie, employed DHI with metal components for gips and tools used on the Comet line. He has examined wreckage parts and is now RAE with serious air test secondary, that no one has made a substantial statement as to the basic cause of the crash. There was no last of his theory.

• It begins to look like ADR may come off worst in this hearing. If anyone does something appears beyond in that direction, but some real Elio-style are expected during cross-examination.



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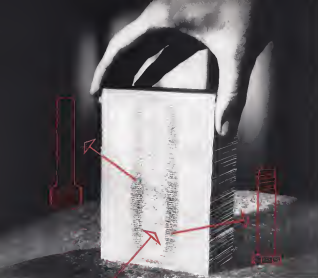
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Final adjustments being performed on alternator-generator drive installation in engine nacelle.

FIRST in mechanical drives

yard



Martin Aircraft Forms Solid Ingots of Scrap Sheet Titanium with Sciaky Spotwelder

The Manufacturing Research and Development Unit of the Glenn L. Martin Company has developed a technique to utilize virtually all their scrap sheet titanium. A six inch pile of 85 laminations of 99.9 titanium with two laminations at each end of 99.9 titanium is joined with one weld in a Sciaky type PMCO-187 600 KVA Three-Phase Spot Welder.

The weld nugget forms a solid ingot of virgin metal at least as strong as the parent metal. This ingot can be machined into a variety of titanium parts. An expensive waste is almost entirely eliminated, and the months of lead time required for delivery of titanium for machining is avoided.

Martin Research offers another fine example of Sciaky basic thinking in design with resistance welding equipment to do more useful work at the lowest operating cost with maximum reliability.

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AJ-1 TANKER-BOMBER shows BTU in during night tests of the Navy's new concept of quickly convertible carrier-based tankers.

Navy Develops New Air Tanker Concept

Navy is seeking additional help from aircraft equipment manufacturers for the development of a new concept of aerial refueling. Object of the new plan is to make every type of carrier-based aircraft, including fighters, quickly convertible for aerial tanker operations.

The new Navy refueling program still is in its early development phase and requires much wider participation by aircraft equipment manufacturers working with aircraft production on problems such as new types of hose retractors, fuel transfer devices, new types of valves, coupling and disconnecting devices and new fuel pump and fuel measuring devices.

Navy is not satisfied with any of the aerial refueling equipment now in use so it must develop new methods.

Coastal-Navy believe it will have to have several types of aerial refueling systems adaptable to different types of aircraft, but as several standard will be quick convertibility about operational carriers, but not precise fuel transfer and a high degree of operational reliability.

At the stage of development it seems fairly obvious that some form of external stores package will have to be developed to give carrier-based fighters, light attack planes, such as Douglas A-1H, or aerial tanker capability.

Navy spokesmen emphasize that the key to the new concept is operational flexibility about carriers at sea. Navy's thinking represents a sharp divergence from the USAF philosophy of specialized jet tanker squadrons in which

it is now investing billions of dollars. Successive Studies-Navy says it cannot afford the luxury of operational tankers within the limited aircraft complement of its carrier groups.

Carrier task force commanders must have the operational capability of launching an air strike at the maximum range that aerial refueling allows on one day and another strike, bombing all aircraft over their normal theater range, the next day.

There is a school of thought in USAF that subscribes to the quickly convertible tanker theory. This group argued convertible tanker bomber versions of the B-47 and B-52. However, top-level USAF planners rejected this plan

in favor of a \$450-million-dollar investment in specialized tankers.

AJ-1 Tanker-Navy currently is developing its interim aerial tanker capability, using North American AJ-1 carrier-based bombers as convertible tankers. North American Aviation supplies a tanker conversion kit that fits onto AJ-1 bomb bay and can be jettisoned quickly like a bomb in emergencies.

The AJ-1 kit uses the probe and drogue method developed by Flight Refueling, Inc., of Baltimore, and this firm is subcontracting to NAA on hose and drama units.

Navy has tested all of its current crop of fighters on the AJ-1 tankers, including the Grumman F-4F. Chance



F-4F BATTLEFIGHT shows up to AJ-1 equipped with probe-and-drogue refueling system.



KAISER FLEETWINGS

STAINLESS STEEL FABRICATIONS

Fully equipped plant of one of the nation's leading fabricators in the aircraft industry works production runs of stainless steel fabrications. Designed and built the first stainless steel delivery system, the BT-42. Rapid experience in special alloys, complete prototype and development shops, accurate techniques facilities permit efficient, close customer work.

Stainless steel and pipe and sheet fabricated for the Republic P-48 and Martin B-57



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FLEETWINGS DIVISION
KAISER METAL PRODUCTS, INC.
BRISTOL, PA.
IN THE HEART OF THE DELAWARE VALLEY

Vought F1U-3 and McDonnell F2H
During the record record transcontinental speed dash of three Greenways 1984s, they were refueled over South Sea Islands by an F1U-3 tanker.

Navy plans to develop a refueling tanker capability for all of its new large carrier-based bombers, including the Douglas A3D Skyraider. This type of tanker would be capable of refueling several Skyriders simultaneously.

All of the Navy's airframe contractors now are engaged in the attack on the refueling problems posed by the Navy's new concept. Among the equipment manufacturers already working with the Navy and airframe manufacturers on this problem are Polaris Aerospace Co., Fletcher Aviation Corp., Bendix Aviation Corp., the Schuette Tool & Engineering Co. and Flight Refueling.

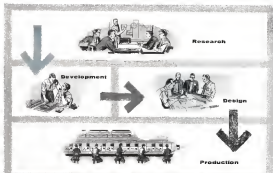
Refuel Mission—Although Navy is interested primarily in aerial refueling as an extension of its carrier-based striking force, it has other applications such as the rescue of aircraft running low on fuel and long-range ferrying operations.

With the advent of commercial jet transports, Navy speculates that the aerial tanker probably will become part of the Coast Guard rescue equipment to school airlines delayed by weather or traffic congestion in steep terminal areas.



French VTO

Swissair, reengineered French engine firm, is using this test stand for preliminary research on adaptation of its Atar gas turbine to vertical takeoff units. As Minister Edouard Calanca says the French have been working on VTO "for some time."



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Integrated Design
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Never Before
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Complexities
Communication
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Hoffman's reputation for getting things done is due, in part, to the unification of Research-Development-Design-Production into one clearly integrated electronics operation. At Hoffman—instead of the usual four completely separate operations—one technical director is assigned to coordinate such new projects from start to finish. Every new project is developed in close cooperation with the customer ahead, including the practical problems of quantity production. This integration probably eliminates the all too common duplication and overlapping of functions, the errors and rework caused by poor design, and materially cuts down the usual time lag between the testing of the prototype and actual production. Hoffman has become a leader in electronics by doing progressively complex jobs—to specifications—and on time estimates—and on schedule.

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Challenging opportunities for outstanding electronics and mechanical engineers. Write Director of Engineering.

Aussies Beef Up Airlines, RAAF

British turboprops compete with U. S. piston transports on wide-open market; defense policy shifts to airpower.

McBroom—Aviation in attended Australia has entered a period of great change, with a guarantee of sizable expenditures of aircraft and equipment purchasing by the military and by commercial airlines.

Choseness of old U. S. equipment, namely DC-1s and DC-4s that no unpolished Australian airlines might get last year, has thrown the civilian airplane market wide open to competition.

• **Policy-Making Post-Success** surface-purchase commitments do include a preponderance of American equipment—Super Coastliners, for Qantas Freight Airways and DC-6s and DC-6Bs for Australian National Airlines.

But future engagement policy is in the cooking pot, with some nations favouring the immediate introduction of Beggs' reforms.

Upcoming, also, is a rapid expansion of airline services as economic development of Australia, a nation of 9 million population, subdues the hinter of a continent nearly the size of the United States, picks up speed.

► **Strategic Position.** On the strategic side, Australia again is assuming a position of importance to the free world.

Not only can it provide physical force, measured in squanders of lighters, bombers and tanks, but its use

guyton, postwar makes it an invaluable operational base to the South Pacific. It is both near the trouble spots of Southeast Asia and remote from the Communist air bases concentrated in East and Northeast Asia.

It would not be outlandish by the deflection of Indochinese into the Communist camp, a constant threat to Malaya and Thailand.

• **Major Airpower Step**—In keeping with its rule, Australia is overhuling the emphasis of its defense policy to air force development. Re-equipment plans for the Royal Australian Air Force (RAAF), provide for Australia's first strategic nuclear bomber element.

This is the first and major step of the aerospace building and, given strategic assessment, it will make the RAAF an important segment of western power in the South (South East Asia Treaty Organisation) region.

RAAF funds for 1994-95 will be about \$130 million, an 18% increase over expenditures of the previous year. Spending will be increased sharply during the next five years. Compared with expenditures of the major power, the total will be small. But for a country of Australia's size, it represents an ambitious step forward in provision for national security.

Moreover, the new Australian defense

The nucleus of a small force of strategic bombers will develop Australia as base to launch "know how" in order to handle heavy bombers, in electronic and including early warning radar systems, and in maintenance facilities.

• **Defense Shopping**—The RAAF is inclined to the extent to adopt use of Britain's V-bombers, particularly the lightweight Avro Vulcan, for the medium bomber units. But a technical means now prevents full utilization of the U.S. in its base of operations.

Policy-wise, the conventionalists, government and the defense services first streamlined on American weapons, but the final result is unlikely to be close cut. Recent defense "shopping" has shown that America is not prepared to let even so close an ally as Australia have products of high security status—Australia wants the best she can get.

♦ **Domestic Production** - Australia wishes to build a good deal of the air equipment in her own small aircraft industry. Today, that industry produces Canberra jet bombers, Vampire jet trainers, the Winged Gull trainer and the Raffe-Royce Arma-powered Sabre.

The government aircraft factories are producing in quantity the Australian designed Jindivik planes, all target aircraft, proved to be successful in test



Navy P2V-7 Gets Jet Power

Lockheed Aircraft Corp.'s latest F-117 displays four powerplants in this first flight photo, twin 5,700-hp Wright Turbo Compound piston engines and two 1,400-lb thrust Westinghouse J4 turbojets slung in pods under the wings. Jets are expected to

increase the Navy subsurface mine plant's normal 360-ship top speed to 75 mph, over the target or as targets. In addition to fitting F2V's, now coming off the line with J4s, Lockheed will equip all F1V-5s and -6s with sets under a \$9 million contract.

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	TRIP-4	TRIP-5
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Suburban Cities	100/100, 100/100 100/100, 100/100	100/100, 100/100
Age in months	0.12 to 0.4 (0.24) 1.00 (0.24) ± 0.76	0.10 to 0.4 (0.24) 1.00 (0.24) ± 0.76
Weight (kg) at baseline	4.0 ± 0.4	4.0 ± 0.4
Weight (kg) at follow-up	4.0 ± 0.4	4.0 ± 0.4

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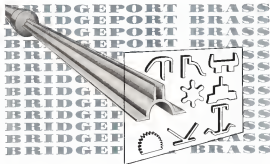
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at the West Coast Aircraft Plant in Los Angeles. CF about 28,000 parts in the aircraft, 7,800 are imported from North American Aviation.

Avon-Sabre

The Avon-Sabre is the design achievement of the privately owned Commosouth Aircraft Corp., welding a Rolls-Royce R.A.7 engine (7,500 h.p. thrust) to an F-86F airframe and joining it with the new British Avon 50-mm cannon.

No official performance details have been announced, but it can be said that this fighter combines a combat radius of more than 975 mi with a rate of climb from the ground and fighting quality above 50,000 ft that has caused those who have seen it as tests and public demonstrations. It has a top speed expected to be 780 mph.

The RAAF will have its first dozen Avon-Sabres by the Christmas, and the initial order for 30 (at a projected rate of production) placed by the joint government policy of maintaining only a nuclear industry) is expected to be completed in 1955.

► **Retromop F-86B**—Is the evolution of the Avon-Sabre only about 10% of

the original fighter structure has been retained. CF about 28,000 parts in the aircraft, 7,800 are imported from North American Aviation.

The R.A.7 contains 15% more air than the F-86, the rate of the intake duct was increased by splitting the front fuselage horizontally and inserting a wedge of structure. As the Avon does not support the tail pipe cantilever fashion, the rear fuselage also had to be redesigned.

Other modifications were needed to accommodate the two Avon 50-mm guns in place of the six 30-cal. machine guns in the F-86. All this was achieved with out making any changes in the sheet and arrangement of instruments, so that any F-86 pilot can convert direct to the Avon-Sabre and find himself in a completely familiar cockpit. ► **Lead Nine—trial** G-6 bombers in ground adjustment by loading the nose with 80 lb of lead. This was done at the production aircraft by moving forward a spring supplying emergency power to the controls.

Early production aircraft are equipped with slotted wings, but next year the solid wing will be introduced. The North American pattern is being made

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Transcendental Tests New Convertiplane

Transcendental Aircraft Corp.'s new 1G convertiplane goes through forward flight, wing back as a tail stand (top photo), then wings at 175°-downward when 90 deg. air velocity 140 (bottom). The convertiplane's

two roles are mounted on the type of a 21-1/2 ft. span, all-wood wing. They are joined by a 100 lb. L-shaped 1750 lb. engine. During a second vertical flight at the company's New Castle, Del., plant, it proved 1,600 ft.

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fuel internally by the incorporation of a leading edge tank to extend the combat range.

The AvonSider will have a flexible rate. At the start a high-altitude, long-range fighter, it can be converted later to carry 1,500 lb. bombs, rockets and possibly even guided missiles the ground attack version.

► **CAC-NAA Link**—The close CAC-North American link dates back 16 years. The most likely follow-up to the AvonSider is a further marriage of an F100 developed with the most advanced Rolls-Royce Avon available at the date manufacture begins.

A series of options would push a Sider and two closely follow-up from the F-100, and some advanced version of a modified Lockheed F-104—reported to be available under license—or some other similar type.

Rolls-Royce is a partner in CAC and the Australia factory already has built an extension for the first engine and the Avon will turbine powerplants. The engine pattern of the latter is, therefore obvious.

► **Financial Plan**—Details of the license agreement with North American have been disclosed. Actually this license is held by the government's government, not CAC. It is an initial payment plus a royalty basis.

The cost of hardware and other components imported from NAA has not been disclosed either. The return to North America, however, is not less than \$150,000 per contract, and it has been suggested that the overall program in Australia would be worth about \$16 million to the American company.

Bomber Production

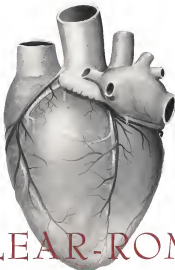
The possibility that a medium bomber line will be built by the government itself between in Australia to the Canberra series exists.

► **Secondary Line**—But the argument is held to be advanced to the United Kingdom government that the at present highly concentrated and available valuable position of the UK industry offers grounds for a declassification program largely supporting the effort, up to Australia of a secondary bomber production line.

Donald Page, Ltd., which recently sent a high-powered mission mission to Australia, is held to be willing to allow the concept winged Vector to be built by CAC.

► **Obsolescence**—It is being urged, that America should consider the obsolescence of placing obsolescence here at a vital contribution to the potential strength of its most dependable NATO partner.

The U.S. should be an agreement with this suggestion, for America's small industry provided not only an in-



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potential supply source to the RAAF in World War II but was a dependable and efficient overhaul facility for the American Air Force.

Small Firms Get Big Slice of B-52 Dollar

Wichita-Changover from production of the B-47 Stratofortress to the B-52 Stratofortress, now under way at Boeing Airplane Co.'s plant here, will not change the percentage of smaller dollars going to subcontractors and small firms, says J. T. Schaefer, vice president and general manager.

• **Dollar Split**—Illustration of allocated funds for the B-47, disclosed at recent conference for the 1,000th test batch at Wichita (Aviation Week Oct. 18, p. 16), reveals the extent of subcontracting operations.

Boeing says that out of every \$100 million spent for the bomber, 55 cents is paid directly to the major and 45 cents is diverted to manufacturers of government furnished equipment.

Further, of the 48 cents given to Boeing, 56 cents goes to subcontractors and vendors.

• **1,800 Suppliers**—There are 1,800 subcontractors and suppliers in the B-47 project. Schaefer says this number will not change appreciably when the plant shifts to B-52 production.

Working for the changeover was started actually when Wichita was chosen for second source production.

Schaefer says almost 75% of the sub-contractors and suppliers for the B-47 are small business firms (those with less than 500 employees), numbering 1,536 plants out of the 1,800 total.

These firms supplied over 14 million. It is estimated that 75% of the engine parts shipping parts and materials to the B-52 Boeing suppliers are small business concerns.

Included in the program are firms manufacturing such aircraft items as bolts, screws, tools, valves, electrical appliances, wires, plastics, auto parts, tests and other machine products.

Schaefer expects suppliers for the B-52 program have been selected and parts already have started to arrive at the Wichita plant—CW.

Germany May Build Lightplanes, Copters

(McGraw-Hill World News)

Rhein-West Germany's aviation industry probably will be unable to build large transport and military aircraft for at least five years, within forward sources here forecast.

Neither capital nor trained staff of

the magnitude required for these types are presently available.

With Allied restrictions on civil aviation to be lifted partially under the new Paris pact, West Germany's aviation industry (Aviation Week Oct. 18, p. 17) can be expected to concentrate on these three enterprises:

- **Light passenger plane**, conceived along the lines of the old MiG-10 "Messerschmitt-Taifun" as the trans-engine Starb 324.
- **Light trainer and sport plane**, similar to the earlier Klemin, Buecker or Stiebel types.
- **German helicopter** designed for short-range operations in city-to-city traffic and for use by West Germany's expanding industry.

Experts here have estimated that the German demand for airplanes and small aircraft at 3,000 to 5,000 planes for the next few years. This estimate is based on the assumption that German engineers and builders will be able to produce a single-engine, two-seater plane at a cost of less than \$2,500 to \$3,500.

The transport of Germany's air force aviation industry will, no doubt, be a new helicopter. Although the country is in the field, the Germans are confident they can produce a "new look" helicopter that will be able to compete seriously with existing U.S. models.

Japan Aviation to Ask \$40 Million U.S. Aid

(McGraw-Hill World News)

Tokyo—Prime Minister Yoshida on his state visit to Washington will ask the United States for approximately \$40 million to revitalize Japan's aircraft industry.

Japan would appropriate \$5 million in its contribution to the three-year program.

Japanese government sources told Aviation Week the plan envisages production of 1950 of 150 F-86Fs, 50 F-86Ds, 60 T-33s, 60 F-26As, 60 T-34s, 60 C-46s, 30 T-27As, 40 B-11s and 60 B-11As.

The basis for this program is the scheduled building of the Japanese air defense force, (PAF), to 1,200 planes in that year.

• **Too Ambitious**—U.S. Air Force officials have questioned the Japanese government that the production phase is too ambitious.

These officials also point out that it is unlikely the U.S. would provide \$40 million while Japan was putting up a mere \$5 million to build up its own plant.

Japan's Ministry of Finance wants most of the U.S. assistance in the

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Next Steps in Atomic Progress... A Challenge to American Industry

The purpose of this editorial is to throw light on the significance for American industry of recent changes in the statutes that control the development of atomic energy.

The need for clear light on the meaning of this new legislation is made more urgent by the political confusion and distortion that marked its course through Congress. The politically inspired charges of "giveaways" that delayed its passage—charges that were almost totally unrelated to the legislation itself—helped to obscure the vital importance of the step finally taken by Congress.

In short, post-Congressional fact, the principal significance of the new atomic legislation is that it extends to private enterprise responsibility for the development of peaceful uses of atomic energy, whereas heretofore this responsibility has rested in a tight government monopoly. And this extension is made on terms that emphasize the responsibility far more than they open any opportunity for economic gain in fulfilling it. The revised Atomic Energy Act provides that:

1. Industry may now own and operate its own nuclear reactors, under license from the Atomic Energy Commission. And it may build and sell nuclear reactors for export.

2. Industry may use—but not own—nuclear materials at the discretion of the Atomic Energy Commission.

3. The Atomic Energy Commission will make available to industry scientific knowledge

that may be useful in developing peaceful applications of nuclear energy.

4. For the first time, industry will have the right to patent inventions in the field of non-military nuclear energy. However, "basic" discoveries must be made available to all companies in the field for a period of five years, after which they, too, will revert to normal patent status.

Two Kinds of Know-How

These provisions, despite the imposed limitations, represent the first positive step toward development of nuclear energy for peaceful applications in the United States. Potentially useful knowledge, previously locked in the minds of government scientists, will now be available to all those who are willing and able to put it to work for the good of mankind.

The advantages to be gained from enlisting the talents of American industry in the development of peaceful atomic applications are imposing. As *The (London) Economist*, Europe's leading economic journal, recently remarked, "The atomic scientists are in a position to surmise how atomic energy can be applied... but they lack the specialized knowledge of engineering design and operating technique just as industry itself lacks atomic knowledge." Now the engineers of private industry need no longer lack the atomic knowledge, and there is granted to them at least a restricted freedom to apply it to the solution of their engineering and operating problems.

But the new opportunity for private industry to find constructive uses for the science of nuclear energy carries with it a grave responsibility. These uses must be so developed that they will benefit the people of all the free nations. It is essential that the United States, which pioneered in developing lethal uses for atomic fission, demonstrate to the world our paramount interest in its peaceful application. It would be a moral set-back to the free world almost beyond calculation if the Communists should be able to offer to the poorer nations of the world the benefit of low cost atomic power—provided by Communist technicians—while we concentrate primarily on building our stockpile of atomic and hydrogen bombs.

Race for a Peaceful Victory

Most of the experts are agreed that it may be many years—perhaps ten, fifteen or more—before the cost of electricity from atomic fission can be reduced to a level that will make it competitive with conventionally produced power in most regions of the United States. But most of the world is not nearly so farsighted as we are in power resources. Electricity, even at a cost far higher than the average that prevails in the United States, would be a blessing in many countries, and the nation that provides the technology to bring it into being will score a great moral victory.

The useful potential of nuclear energy is not restricted to the generation of electric power—although twenty years from now this use will be highly important to the power industry of the United States. Even with the limited research that has been done in this field thus far, the use of radioisotopes—the radioactive products of atomic reactions—is saving American industry an estimated \$100 million a year. Commissioner Campbell of the AEC, who made this estimate, believes that these savings may well reach \$1 billion a year within ten years. Radioisotopes are already at work in industries ranging all the way from paper manufacturing,

where they measure paper thickness, to pipeline transportation, where they mark the dividing lines between shipments of different products (at an estimated saving of \$500,000 a year). Medical applications of these same radioisotopes hold promise of longer and more comfortable lives for those who are stricken by cancer and other diseases.

Above All a Challenge

The new Atomic Energy Act is a crucial stride toward the day when all these benefits—and undoubtedly others not yet revealed by research—will be realized. But it is a step that is essentially permissive. It still leaves it to private industry for the most part to decide what is to be done and how soon.

The new act is thus, above all, a challenge. It orders on private industry the responsibility to assume a leading role in the development of peaceful uses for nuclear energy, a step long urged by NUCLEONICS, a McGraw-Hill magazine devoted to atomic energy. To achieve a success in this task that will measure up to the requirement of the national interest, this development must command all the resources and ingenuity that private enterprise can apply—and do so without promise of glittering prizes surely to be won. But now that the responsibility has been defined and the challenge offered, American industry will, we believe, measure up to its grave and mighty import.

This message is one of a series prepared by the McGraw-Hill Department of Economics to help increase public knowledge and understanding of important economic developments that are of particular concern to the business and professional community served by our industrial and technical publications.

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**Pan Am's new coast-to-coast "PAY-LATER" PLAN
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If the commercial air industry ever needed a shot in the arm, this is it.

Last May 1st, Pan American inaugurated the destination-wide, coast-to-coast "travel-on-credit" plan. This plan works in all 48 states and Hawaii, and it was an immediate success. Thousands of people have already agreed to fly all over the globe on the Pan Am "Pay-Later" Plan. More than 90% of the sales—nearing the second million dollars—represent new business.

Not only has this idea caught on with the flying public, but it has won the approval of the entire industry as well. Within a few weeks, imitations began to crop up everywhere . . . by

both U.S.-flag carriers and foreign airlines serving the United States market.

This new trend in travel has widened the market for air transportation and it has put air travel in a competitive position with other day-to-day commodities. Americans have long been accustomed to buying their automobiles, homes and appliances on installment. Now they can take *beginner and better vacations* in the same way.

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from five direct dollar grants. But it is probable that any U. S. help would be in one allotment out of the proceeds from sale of U. S. surplus wheat and other agricultural commodities in Japan. Japanese air officers say they do not care whether they receive yen or dollar help from the United States as long as they get the money.

► **Plans in Progress:** In 1958, they anticipate buying an air depot which will include: 472 F-80Fs, 158 F-60Ds, 173 T-33s, 280 T-28Bs and T-34s, 96 C-46s, and 54 F2V's.

The Northeast and some helicopters would be in a very air arm which can be a part of JADF, other than under the maritime safety laws.

If the Japanese obtain the help which they are seeking, four manufacturers would share the benefits. Mitsubishi Heavy Industries, Nagasaki, Ltd., for the North American F-86 and T-28 and the Sikorsky H-19, Kawasaki Aircraft Co. for the Lockheed T-33 and the Bell H-13, Fuji Heavy Industries, Ltd., formerly Nakajima Aircraft Co., for the Beech T-34, and Shin Meiwa Industries Co. for the Lockheed P-2V.

Assistance to the Japanese industry from the U. S. would likely will be considerably less, and much of the Japanese activity, even so 1958, will come out of assembly and repair of aircraft received from U. S. stocks.

Small Firms Can Save Tax Dollars: SDIA

Los Angeles—Small Defense Industries Assn. has urged government action on dangers that face many qualified aircraft subcontractors as a result of being overlooked in subcontract planning.

Harold Westworth, chairman of SDIA and president of Longview Aircraft Co., told a joint conference the results of a survey show that some small business enterprises are suffering setbacks.

► **Lean and Mean:** Westworth stressed the importance of recognition by government defense procurement planning agencies of the flexibility and dollar saving advantages of the quick small defense producer.

"We know from statements made that the next two years are going to be lean and mean," he said.

He pointed out that for the first time a study of qualified defense industries have organized representation. American Works Co. (A. W. C.) Proper utilization of the SDIA, Westworth said, could build stronger interdependence between the large and small defense manufacturers and produce more defense for less dollars.

► **Competitive Chance:** Joining the plea for a stronger small defense plant



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role was Gus W. W. Katz (USAF Ret.), president of Electronic Products Co., Santa Barbara, Calif.

He and the next step of SDIA calls for forming a coordinating committee of representatives from the Air Force, Army, Navy, Department of Defense, Commerce Department, Small Business Administration, Aircraft Industries Assn., Chamber of Commerce and the SDIA. This group would be responsible for finding ways to utilize productive potential of small plants to the maximum extent.

"We do not risk for coddling or hand-holding. All we want is a competitive chance," he said.

Lee Peck-Gaugh Wing, president of High Shear Rivet Tool Co., reported on his contact with the office of the Assistant Secretary of the Air Force for Material.

Wing appeared concerned over statements that indicated the subcontractor and supplier would be the first to feel the effects of production cutbacks.

"Smaller subcontractors are able to produce parts more economically, but that the government is allowing the primes less profit on subcontracted items," he said.

Wing suggested that large contractors be given more production incentives and not be penalized for production for doing with the small defense producer.

Lee Predicts Stable Airport Aid Program

Federal airport aid should be continued in fiscal 1956 "as a stable at least as large as at present," says Civil Aeronautics Administration Frank E. Lee. The airport and appropriation for fiscal 1955 was \$22.5 million.

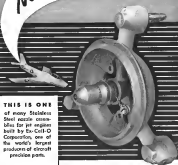
Lee reports that in view of President Eisenhower's plan for an extensive program of highway improvements, all forecasts agree that the new trend will be felt in civil aviation, and there is every reason to believe that the Administration will share the civil flight and agreement in making a program to meet existing airport needs.

Budget Bureau now is considering the Commerce Department appropriation request for the next fiscal year, to be presented to the new Congress when it meets in January.

Special Studies—Lee told the Airport Development and Operation Conference in Syracuse, N. Y., that there are "special situations" to be considered in determining eligibility for federal aid.

The Commerce Department's report panel recently recommended that "national interest" should be the determining factor. Commerce has developed cutoff points of 1,000 annual

Nozzles for JETS



THIS IS ONE
of many Stainless
Steel nozzle assem-
blies for jet engines
built by Ex-Cell-O
Corporation, one of
the world's largest
producers of aircraft
precision parts.

There's something of Ex-Cell-O in practically every plane made in the U.S.A. today.

Illustrated below are typical blades, nozzles, hydraulic actuating assemblies and fuel control assemblies, precision built by Ex-Cell-O Corporation to aircraft builders' rigid specifications.



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Test Set is Portable—Weighs 28 lbs.—Power supplied—by DC only, this provides
variable operation above 115V. Over 100 sets in current use

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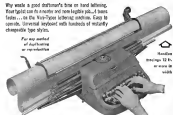
USED BY LEADING AIRLINES OF THE WORLD
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explained passengers per year and a hand
sawly project of 30 aircraft as a
notable change in determining and
qualification (Aviation Week Oct. 15,
p. 34).

The "special interests," Lee says,
would include:

- Airports that have definite value as
emergency fields along routes with sub-
stantial air traffic.
- Airports with unusual traffic that is
very active only during certain periods.
- Airports where air cargo, rather than
passengers, indicates their importance.
- Other cases where the movement of
passengers and aircraft does not indicate
the true degree of activity.

"These criteria," the CAA Administrator says, "provide a basis for recon-
sidering the program upon airports of
national significance." There are some
700 airports throughout the country
which would satisfy the criteria, with
out considering additional airports
which might qualify because of special
modifying factors."

► **Operational Factors**—Lee expects the
program would be used to be
accomplished are aimed at national,
rather than local, importance.

"By including such items as terminal
buildings, auto parking areas, exhibits
and other items of predominantly local
interest, the program can be consi-
dered open to discussion which involves
the safety of its operations—such as ap-
proach procedures, runway, taxiways,
lighting and related facilities."

Prime need now is the improvement
of existing facilities, Lee believes. The
1951 National Airport Plan lists 3,500
conventional airports as needed, of
which 1,765 are in operation and only
293 would be new facilities.

- **Improvements** most urgently needed,
Lee claims, are:
• Longer runways of adequate strength.
• Taxiways to facilitate ground move-
ment.
- Model taxiways to lessen queue exits
from runways.
- Clear approaches to runways.
- Clear approach areas to accommodate
converging patterns of aircraft.

Administrator Lee also admits that
CAA is considering making the estimate
of passengers to be carried by airlines in
1950 from 40 million to 90 million.

Weather Experiment

Transmission of the latest aviation
weather and meteoric to citizens by com-
munications your broadcast from a few
degrees into stage at Anco, Va.,
has been inaugurated as an experiment by
the Civil Aeronautics Administration
and the Weather Bureau.

Residents are being made from
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rockets bring weather forecasts for an
area within 216 mi. of Washington.

Smooth Power...Big Lift



- New Cessna 180 Gets Off Quickly, Cruises Quietly With 4 Passengers And Luggage
- Out-Performs Any Other 4-Place Airplane—Yet, It's Priced \$6000 Under Competition



New, Cessna 180 challenges competition! Offers you faster take-offs,
shorter, smoother landings... better range with a greater load... more
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on the market! PUNCH smoother, quieter performance, over 100 m.p.h.
cruising speed! Full engine control, excellent view cabin and cockpit, dozens
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See and fly the new Cessna 180 at your nearest Cessna dealer today! (See
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High Wing—Soft Ride

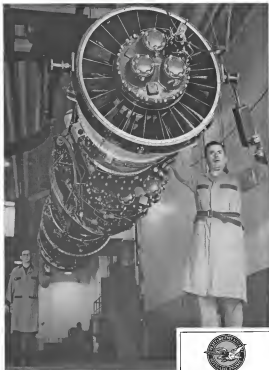
With Cessna 180 high-wing design, center of lift is about
ten feet of gravity, providing greater stability, smoother flight,
freedom from gusting and rolling. High wing also protects
you from fuel heat and glow, improves your view. Extra mainte-
nancing has been added and the Cessna 180's large heating-
cooling system, 100 watts and delivery, keeps cabin tem-
perature comfortable regardless of altitude or weather.

New "Easy Access" Luggage Door



Conveniently located on the
side of the fuselage, the
luggage door is 220 lbs.
of luggage. Or, by rotating
the door, you can load
200 lbs. of luggage in the Cessna
180's Outboard equipment for
the 180 includes also, built-in
storage for radio, maps,
photography and equip-
ment work.

4 GREAT CESSNAS — THE COMPLETE AIR FLEET FOR EVERY BUSINESS NEED



One 18,000-lb thrust class Pratt & Whitney Aircraft J-57, equipped with afterburner for combat savings of tremendous additional power, is the heart of the Super Sabre's supersonic performance.



ONE OF THE DIVISIONS OF
UNITED AIRCRAFT CORPORATION



Slippery swept-back wings and tail surfaces mark the North American P-100 Super Sabre. Built around one Pratt & Whitney Aircraft J-57 turbojet and afterburner, the Super Sabre is the Air Force's first operational supersonic jet fighter.

Super Sabre Has Supersonic Performance

Sustained level flight above Mach 1 is a vital attribute of the latest U. S. fighting aircraft, and North American's P-100 Super Sabre has it.

Such hard-won capability—possessed by only a few production aircraft—is the product of highly advanced airplane design wedded to a flexible, efficient turbojet engine of enormous power.

The sleek Super Sabre is now being built in quantity for the U. S. Air Force. Equipped with the

Pratt & Whitney Aircraft J-57 turbojet and afterburner, it has already set the world's speed record of 752,840 miles per hour—an enviable beginning for a fighter on which so much depends.

In the Super Sabre, as well as in other supersonic fighters and high-speed jet bombers, performance of the Pratt & Whitney Aircraft J-57 turbojet is fully justifying the long years and intensive effort required for its development and production.

Pratt & Whitney Aircraft

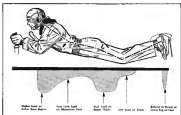
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PILOT LIES PRONE in Midget, Martin close-support proposal. Though never built, its design features still make sense today.



NOSE CAPSULE is designed for maximum pilot protection. Pilot had to duck slightly.



PILOT SUPPORT is made of reinforced plastic gilded with thin rubber for comfort.

Martin Midget

By Irving Stone

Railhouse—The tried both here and abroad toward lightweight, simple construction for specific jobs is evidenced in my current design proposal submitted to the Air Force by the Glenn L. Martin Co.

Martin's specific design concept—a close air support weapon—is as valid today as it was when submitted about two years ago. Brought up to date, it probably would be better, include wing sweep, and have better faster climb rates than the original proposal presented.

The Air Force liked the design, Martin reports, but the plane was not built because budget funds were not available at the time. Also there was no need to get organic, available with sufficiently low fuel consumption, it is said.

Nevertheless, the design highlights numerous features of top interest to both designer and technician.

► **Size.** The Midget job—known as the Mighty Midget, the aircraft is a heavily armored, ground-pilot configuration, only 25 ft. long and with a 25-in. span, powered by small twin jets for an over-500-mph speed at sea level. Maximum useful load of 4,500 lb. exceeds its empty weight, and maximum endurance at sea level is 15 hr.

The weapon's job: Provide more effective close air support for heavily ground forces under conditions of modern warfare.

Martin saw it this way: While the strong power of heavier and lighter bombers focus destruction and dispersion of enemy ground forces, the



EMERGENCY ESCAPE FEATURE allows pilot to be protected in protective zone which breaks away from remainder of fuselage.

Tailored for Close Support

situation also gives rise to a tactical condition making the enemy more difficult to locate and destroy—from the air as well as on the ground.

For adequate close air support of ground forces, Martin felt a new plane was needed, replacing such a weapon by adopting existing aircraft for the job did not produce the desired weapon efficiency.

► **Spot and Attack**—The close support weapon contemplated by Martin designers would combine the best features of target spotter and attack plane types. It would locate, identify, and mark targets for concentrated attack, destroy "targets of opportunity," such as a motor column.

As an antipersonnel weapon it would carry an forward-firing machine gun with combined firing rate of more than 4,000 rounds per minute.

As an anti-tank vehicle, it would fire two cannon, rockets or missiles. For

antitankwork work, it would have a large bomb or rocket load in addition to machine guns or cannon.

► **Midget Characteristics**—As projected by Martin engineers, the Midget would possess:

► **Maneuverability** associated with an "ideal" crop duster. The plane would have a 120° endurance, have a point-pilot position.

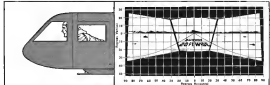
► **Little vulnerability** to enemy ground and aerial fire. A heavily armored nose capsule affords protection from 50-cal and 105-mm ground fire.

► **Mounting provisions** for a wide variety of armaments, including aircraft gun, the forward firing.

► **Shortfield takeoff** and landing characteristics for operations from forward areas.

► **Adequate pilot-escape provisions** in the form of a dash fitted jet-engine nose capsule.

► **Rugged, simple structure** for high



PILOT VIEW from Midget nose gun wide field. Nose capsule has five windows, with two side glasses indicating blind area.



UNDER ONE ROOF

By James J. Haggerty, Jr.
(No. 8 in a series)



"Room for 70 football fields under this roof—room to build bigger bombers and transports"

Says James J. Haggerty, Jr., *Airline Staff Writer, Collier's*

One football field covers more than an acre, yet in Marietta, Georgia, there's an aircraft plant with a single building that could house 70 football fields.

This structure is just as important as it is amazing—important, of course, to U. S. defense. The plant was built by the government for a purpose—to manufacture big crash-ejection airplanes in quantity with utmost speed and efficiency.

Today GACP-6 (Government Aircraft Plant No. 6) is operated by Lockheed for the U. S. Air Force, is building big turbo-prop C-130A assault transports and six-engine B-47 jet bombers, more than half the parts being made under the same big roof. Another production line modifies early B-47's, and

there's still room for a fourth production line.

GACP-6 is not just big for biggest; take that for production efficiency. And the record made there in the last three years proves the advantage of "everything under one roof": (1) the B-47 force 60 days ahead of schedule; (2) maintenance and repair production all on schedule; (3) new bombing planes with 25% of original man-hours; (4) bombers leave now 75% and still going down, well under the 80% industry average; (5) third best safety record in the entire industry.

Already a vital part of America's defense industry, GACP-6 can easily produce even more and bigger planes for U. S. protection.



SIDE-FIRING GUNS eliminate time-consuming maneuvers after continuous short-range attack on extended perimeter.

utilization, little maintenance.

• Low-cost characteristics

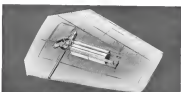
• Armored Ejection-Seat protection is emphasized in the design. Cockpit is a heavily armored, pressurized capsule housing an automatically released chair. It is intended to protect pilot from all possible ground fire direction.

Now is constructed of 1-in. thick Plexiglas-encased laminated aluminum to take most of probable ground fire hits in glancing shots, stop all but about 34-cal. and 30-mm. hits striking with an impact velocity equivalent to muzzle velocities of rock guns. Direct 35-cal. frontal hits will penetrate the plastic laminates, the design does vary, but will be stopped by a 1-in. coated, aluminum alloy plate.

Windows are bullet-proof glass for protection against head-on hits from gunfire as large as 75 mm. Front windows are 3 in. thick, two adjacent side windows are 2 in. thick; all side windows are 1 in. thick.

New capsule skin is 3-in. aluminum alloy, intended to deflect point blank projectiles up to and including 20 mm and at angles up to 75 deg.

• Body-Bed-Plate's support—6-in. T-beam laminates bed padded with foam rubber—is contoured for maximum body strength, best body weight distribution, high freedom of action, maximum resistance to effects of high ac-



ONE ARRANGEMENT combines two side-firing guns with one forward-firing gun.



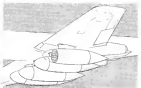
ANOTHER SCHEME incorporates three forward-firing guns in each wing panel.



COMMON is mated quickly in switch from window gun. Used for full width.



EIGHT ROCKETS. Two HYVAR units can be tested by Midget.



ALTERNATE ARMAMENT PLAN shows for rocket clusters.

U.S. Air Force
Govt. Aircraft Plant No. 6

Lockheed
Aircraft Corporation
(a Lockheed International)

Georgia
Division, Marietta

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Air specialists of air conditioning equipment and pneumatic accessories for high speed aircraft.

Elevator Control



Rudder Control



CONTROL for elevator and rudder may be operated by one hand, as shown in diagram.

controls. It is designed to absorb load and upper torso shock loads from capsule chute landing at aircraft belly landing. Pilot's body is held in the support by safety belts to prevent slippage at impact.

Protection is afforded by the support from any 30-cd. darts from below, if they penetrate the bottom skin and into the retractable seat pan.

Chin rest may be lowered out of the way, is designed to provide most comfortable head position and best line of sight. Windshield posts disappear almost completely from the field of vision, Martin says, due to the different refraction angles in the forward and side panels. Side panels give broad viewing field directly left and right and toward the rear.

•Capsule Release—Emergency release control for the chute-engaged nose capsule detaches from explosive bolts securing the capsule to the fuselage,

also raises pilot's chin rest to act as a support for his head at impact.

The turret the bottom load on the four explosive bolts is raised by the firing, its electrical leads and control lines between capsule and fuselage are parted at quick disconnects. There are no transmittable lines between the two loads.

The 10-lb. diameter chute is ejected automatically, opens in 5 to 4 sec., has a beltdown rate of 15 ft. After landing, the capsule serves as an armored shelter. It is fitted with small arms, fuel and supplies, and emergency provisions.

•Control Details—A simple three-dimensional hand-and-eye control system is used. Two of the three controls—elevator and aileron—are same as with conventional control stick, while the third, for the rudder, follows the bicycle handlebar movement.

A photocopy test is used to dis-

(Continued on page 15)

Martin Midget—Specifications

Weight empty, lb.	3,666
Design gross, lb.	4,486
Maximum allowable gross, lb.	5,296
Design useful load, lb.	2,830
Maximum allowable useful load, lb.	4,860
Total useful load (with air load conditions), lb.	2,690
Total thrust with afterburner (static), lb.	1,280
Maximum horizontal speed (15,000 ft.), mph.	512
Maximum steady state turning radius, ft.	615
Bank angle for minimum turning radius, deg.	85.0
Maximum endurance (15,000 ft.), hr.	34
Average speed for maximum endurance, mph.	346
Takeoff ground run, ft.	920
Takeoff distance (to clear 50-ft. obstacle), ft.	1,260
Landing roll, ft.	990
With parachute brake, ft.	580
Landing distance (to clear 50-ft. obstacle), ft.	1,510
With parachute brake, ft.	915

(All values of 15,000 ft. are increased by 10%)

TOMORROW'S AIRCRAFT: *One step closer*



Prototype to production ... in shorter time and at less cost

During systems study or systems development, project engineers face this challenge: Where to look and how to get the best of what's new?

There's one unique source for the latest in technology and products—Westinghouse. Unique because of two vital factors: Unparalleled research and development facilities, and product families covering every phase of aviation—especially airborne electronics, electrical systems and motors, and airborne propulsion systems.

NOW—find out more about this unique source and the few big ways Westinghouse can help you...

Westinghouse



E. H. Wilson, Defense Products Sales Manager, points out the highly specialized fields where Westinghouse can assist and supplement your design activities . . . to build better aircraft at the lowest possible cost . . . through development, test, manufacturing and field engineering.

*Westinghouse offers an entire Institute
a broad line of aircraft equipment*

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- 4 ELECTRIC SYSTEMS
- 6 HYDRAULIC SYSTEMS
- 3 LUBRICANT SYSTEMS

*component parts and complete systems
and both specifically to help you go
from Prototype to Production . . . to deliver
into use at low cost*

Development labs constantly advance state of the art . . . are prime source of better systems concepts

Westinghouse has a basic credo: To develop the type of equipment and complete systems which will help aircraft and equipment builders meet military and commercial specifications. Emphasis is on tested progress with the highest possible degree of dependability. To implement this, Westinghouse has over twenty-three laboratories working in every area where aviation may possibly be advanced, and these labs are

staffed and equipped with attention to every skill and necessary device. The result: History has shown that Westinghouse research and development contribute continually to aviation progress—it is a prime originator of new ideas and concepts. Here, then, is a prime source for better equipment and improved aircraft performance, from an experienced supplier capable of giving you the most for your aircraft dollar.

But what about test and evaluation? . . .

**YOU CAN BE SURE...if it's
Westinghouse**



The Siva de Siqueira generator of the Westinghouse Research Laboratory has long been recognized as the symbol of scientific pioneering undertaken by the Corporation. Efforts span over the whole world in search of new knowledge — much of which has contributed to the advancement of aviation.



At Air Arm Division, aviation-related typical laboratories, have every possible facility to test components and complete systems to the vital degree level facilities. This includes up-to-date systems used and data, test theory and capabilities—both tools and procedures being made throughout development and production.



Westinghouse experience and facilities are available when new systems need a final check. Here, engineers define in the particular performance of aircraft electrical systems equipped a new product in the research room—with an analog computer for testing the general of every possible performance—the first step toward design qualification.



The Aviation Gas Turbine Headquarters has one of the country's largest and most complete aircraft engine facilities. A complete history is built in a line center of assembly, development and part improvement. New ideas are taken from design to test to develop shape then introduced by actual performance testing.

**Every known test used
to prove components, qualify products
... from concept to actual service**

Westinghouse believes there is no substitute for real, in-flight shakedown. At Air Arm, all equipment is given the final evaluation. Complete facilities are available to operate flying test beds and at present there are eight types of aircraft being used on various projects. The 75,000-square-foot hangar stretches directly to the new Friendship International Airport. By going to such extensive facilities, Westinghouse proves out its own design and reduces the burden of "de-bugging"



From long experience, Westinghouse knows the best plan is side-by-side development, test and evaluation— for no product or system is better than its ability to perform to specifications. Each Westinghouse Division has complete facilities—many of them Westinghouse developed—for all required mechanical and environmental tests, simulating every possible extreme situation. Reliance is always placed on proved components

and qualified products as the soundest answer to advancement. This Westinghouse test and evaluation concept is applied to products and systems at every stage of development and as thorough assurance to actual service. It is one of your best guarantees that this source of ideas and products offers around "extreme" in reliability, can give you extensive help in meeting the rugged test of specifications—all the way.

YOU CAN BE **SURE**...if it's **Westinghouse**



The Atomic Gas Turbine Development at Westinghouse develops—grades, proof stress at test, installation and qualification of all components and products. Here, a jet engine assembly is being given a complete operational check prior to release for installation. This close attention to performance follows every engine from development through production, where completed engines are given two complete test cell runs to prove that they meet specifications.



Life testing of all electrical equipment takes a vital part in the Aircraft Department of the Small Motor Division. Highly specialized facilities—such as the one shown—simulate operation and motor service life to determine bench life and picture. The results are then cross checked with other evaluations, such as high altitude chamber tests. Complete systems and their components can be tested and proved for performance under any climatic or mechanical environment.

Now, the end result of all this...



Jet engine pioneering—the Aviation Gas Turbine Division plant covers almost eighty-five acres in Kansas City, Missouri. It houses jet engine research, development and production—all under one roof and equipped with the latest facilities.

Specialized plants and corporate facilities give capacity, flexibility . . . produce to specifications

Westinghouse in aviation also means the best and most complete plants and production facilities capable of building precision and ruggedness into every product. The Westinghouse aviation family offers three-way flexibility to assure both quality and quantity. Twenty-three divisions specialize in their product lines, strategic locations and special headquarters facilities

put product "families" close together, make it possible to utilize skills and capacity of other plants whenever necessary, modern production equipment takes full advantage of new techniques, constantly produces to close specifications. These are all big reasons why Westinghouse can offer such extensive help in backing up your design efforts on new aircraft.

The Air Arm Plant in Baltimore integrates all aircraft electronic activities under a single, Westinghouse owned roof. Complete development, test and manufacturing facilities are available to you, for almost anywhere in the industry.



The Seed Motor Division at Lima, Ohio, combines specialized technology, machine equipment and extensive "cut-up" facilities in design and build highly advanced aircraft electrical systems, drives, motors and controls.



Engineering follow-thru insures performance, gives user full value of equipment and systems

From prototype on, Westinghouse field engineering is of vital assistance in helping you qualify the aircraft for operational service. Engineers are highly skilled in their product lines, ready to provide all necessary assurance for successful use of product and systems. This also is a Westinghouse credo. To assure product performance, to give the user benefits of continuing

technical advances in design and application, and to assist in training of operational and maintenance personnel. By providing this full measure of service, Westinghouse can intelligently and sincerely offer assistance and equipment manufacturers a complete partnership, directed toward selection and application of the best possible equipment and systems for the job.

Now . . . see how to put Westinghouse on your team . . .

YOU CAN BE SURE...IF IT'S Westinghouse



Look to Westinghouse—get newer concepts, better systems for greater margins of technical superiority . . . prototype to production

If you want to see you realize . . . aviation is very much our business. These Westinghouse facilities—barely covered here—offer you a real, hard-working source for solving aviation problems. Advancement comes both from individual product developments and from basic areas like metallurgy, fuels, combustors and nuclear energy. Much of it, of course, is classified, but readily available for use by qualified recipients.



YOU CAN BE SURE... IF IT'S
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Gentlemen:

If you are interested in getting literature and product information as follows:

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- ☐ Aircraft Electrical Systems
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- ☐ Other

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Basic aircraft systems

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Ground equipment

Wind Tunnels • Airport Lighting • Industrial Plant Apparatus

70 GET INFORMATION OR ACTION

Call our field representatives or write Westinghouse Electric Corporation, 3 Gateway Center, P. O. Box 545, Pittsburgh 30, Pa.

For general information and technical literature, just check and send the coupon below:

47-484

(Continued from page 46)
turbine between forward-left pushbutton for elevator control and the rudder control, when we land operation is said. A push or pull control with push-button is the direction of taxi and the movement, while push alone, rotating the tendency to turn given elevator movement, Martin explains.

Control system has a linkage to double the pilot's wrist thrust mechanical advantage by exaggerating the push button for rudder control movement. Martin says that exaggeration shows about ten times wrist force versus up to 160 lb. in, while a value of 180 lb. is more than enough for one-hand control of the Mighty Midget during all normal maneuvers.

Armament Schemes—The plane's design useful load permits basic armament arrangement to be either two 15 mm. 12 mm., or 27 mm. 7 type cannon, plus 100 rounds for each installation, or 30-cal. machine guns and 5,000 rounds.

The machine gun installation may be forward firing (three per wing) or a combination of forward firing (one per wing) plus upward guns (two per wing) for defensive firing.

The upward gun, angled slightly

above wing, comes in handy for the pilot to avoid time-consuming maneuvers. Then, targets which are in front of direction for close to the flight path cannot be engaged because they are usually inaccessible to the plane's armament, Martin explains. Hence, to destroy the target, pilot must first perform certain maneuvers, which may not only be time consuming, but may be responsible for being downed himself. The additional upward gun gives pilot a weapon to use when he spots a target close to the flight path.

When the basic weapons are arranged, the plane could take an equivalent weight in bombs or rockets. Under this arrangement, eight 5-in. high velocity aircraft rockets at four 2.75-in. adding for rocket clusters containing 15 rockets per cluster could be used.

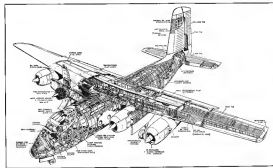
Proposed Field Loads—In addition to basic armament, external stores up to 2,000 lb. can be carried when operating from prepared fields with adequately long runways for takeoff with main wing alternate loads. Alternate loads in addition to basic armament cover two 1,000 lb. or four 500-lb. or four 250-lb. general purpose bombs, two 1,000-lb. armor-piercing bombs, four 500-lb. fragmentation bombs, two

500-lb. smoke bombs, or two 150-lb. or two 175-lb. napalm bombs.

Engine Plan—Martin specified two jet powerplants for the Mighty Midget, because two engines operating at cruise power would easily provide the high thrust thrust required for short fields, also because fuel consumption could be cut by using only one engine during cruise. Two engines would also give the pilot the chance to get back if one were battle-damaged.

Maneuverability Factors—The plane's low wing loading and high design load factor (with 1.5G extra) with 14 factor of safety, bringing ultimate load factor equal to 18G allows short radius of turn and pull-up over the entire speed range. Landing radius is between 700 and 620 ft. in emergency under combat conditions at speeds from about 167 mph down to about 175 mph.

Benefits of shorter pull-up are emphasized by Martin. His say, experience and theory show that accuracy of aerial gunfire is directly proportional to line-of-sight distance between aircraft and target. Data at the time the Midget design was worked out reveal that 50% of the rounds fired by average pilots fell within an impact zone with a radius



Inside Details of New British Medium-Range Airliner

Englashing entries of Hawley Page's new Herald medium-range transport show two national design and thinking. A production line now is being set up, and the prototype is expected to fly next year. Designed to

carry 34,000 lb., the Herald will seat 56-64 passengers and cruise at 230 mph at 50% take-off power. Wing span is 51 ft., length 70 ft. 3 in., height 12 ft. 6 in. Cabin will be partitioned with continuous differential

of 3.15 ft. by ft. The Herald originally called the H.E.R. 70, one of many proposed DCA replacements, has been ordered by Queensland Airlines, Australia. Delivery is expected in 1957.

equal to 215 of aircraft to target distance.

In a head-on attack, maximum distance at which a pilot can engage a target is a function of the craft's pull-up motion. Hence, when flying a plane with shorter pull-up ratios, he is able to be delivered at shorter range.

► **Interchangeability**—Production-standard logistics considerations stress interchangeability. The same part is used for sudden and left and right elevators. Flaps are interchangeable, and left and right elevators may be substituted for each other.

Small size of the plane's major sub-assemblies eases transportation problems.

THRUST & DRAG

"Maybe I'm a pessimist," said the engineer, "but the more I work at pulled missiles the more I'm convinced that the way we're doing things is all wrong."

"We got missiles coming out of the hump-out of everything and two of those of them. We put big missiles, small missiles, simple missiles, complicated missiles, and missiles and white missiles, but we haven't got the most important missile."

"And that is . . ." I said.

"No machine yet invented can take the place of experience."
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"A reliable missile," he said.

"What do you propose?" I asked.

"Well, I'd like all the projects that haven't done much—and God knows there aren't too many—and I'd give you all sets of drawings of the V-2. I'd tell all of you to build V-2's and fire them until they got to the point where there were no missiles in the German arsenal in the field. Then I'd freeze the design, and have the cheapest production price then set for a while."

"I'd stop these out to the Army Field Forces and let them fire to their heart's content until they knew how to handle missiles in the field. They'd take them on maneuvers, let 'em sit out at the sea and use and fire, too, 'em down hills and across the open fields. Then when about a year they'd have most idea of how to operate in the field with missiles."

"And then I'd take some care out of those units and send 'em around to help write the military requirements and to advise the project engineers and stand by during the development program."

"That way, we'd at least have a 200-ers tactical missile at reasonable accuracy and it would be reliable and the boys would know what to do with it instead of standing around with their thumbs in their ears and being amazed by the trick in scientific toys."

Two German engineers went to Sicily recently as one of the many "exchange" visits which settle away the iron between designing airplanes. They had problems to discuss with their leaders in cases at Boeing, and the command then drop into the afternoon.

Came time to head back out to Seattle and the level one of the Boeing engineers offered to arrange transportation in the regular company shuttle bus. That vehicle was returned to the door, but there was another Boeing car right behind, also going westward. "You get on, but the bus ended its run at the Red Cross blood bank."

Now the Boeing engineers is having a rough time convincing his German crossers that the whole thing wasn't planned, and that Boeing really doesn't demand blood in payment for technical information.

When we saw these pictures of "Push over" a few months back (Aviation Week June 21, p. 35), we failed to comment on the photograph, Col. Paul W. Maxwell, Jr., of USNARTS Lake Denmark, N. J. Col. Maxwell photographed the loaded V-2 while it was being shipped, providing the only motion picture record of the postwar jets that has been released.

Those pictures, plus Maxwell's com-



After

After heat treatment, hardening, straightening and grinding, axle shafts come in this machine room to be turned, spun, bored and polished. These axles must withstand hard service in winter, summer, desert trails, and steep grades.

Below

After heat treatment, hardening, straightening and grinding, axle shafts come in this machine room to be turned, spun, bored and polished. These axles must withstand hard service in winter, summer, desert trails, and steep grades.



USS Carilloy Steel used in axles of heavy-duty trucks

A big cross-country tractor-trailer rig needs a high speed axle on the open road. But this same rig needs a low speed axle with tremendous pulling power for grinding up steep mountains and trudging through city traffic. Modern Manufacturing Company's 2-Speed axle solves both problems; they provide one gear ratio for heavy pulling power, another for high speed operation.

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'Pilot' Takes Orders From Arms System

• Design philosophy behind Minneapolis - Honeywell's E-10 auto flight control: Tailor system to the plane.

By Philip Klass

Minneapolis-In the new E-10 auto flight control system, Minneapolis-Honeywell's Avionics Division has put the design emphasis on a system capable of maneuvering a plane along a flight path prescribed by a computer for control or a bombing computer, rather than attitude and heading stabilization as in older autopilots.

The term "automatic flight control" including the familiar "autopilot" reflects the E-10's operational role and increased capabilities, which include such features as all-attitude maneuverability, restricted maneuver, and variable Mach number direct mode control.

Developed under the sponsorship of the Wright Air Development Center, the E-10 will be its first operational use in a late model of the F-108.

• **Visible Building Blocks**-Actually the E-10 is a group of visible building blocks which M-H believes can be engineered quickly into a system capable of handling almost any of the new high-speed fighters, interceptors, bombers or transports.

Behind this philosophy is the recognition that autopilot controls must now be tailored to individual airplane configurations and manufacturers, but that there is never enough time to start from scratch for each new airplane.

• **Light Is Weight**-In the lighter-mechanics version, the E-10 weighs in at around 65 lb., mounted. The new system weighs only one-third as much as the Honeywell C-3 autopilot used on E-28s during World War II, yet offers many new operational features. Wright figures that not include a 6-in. vertical gap. The E-10 uses signals provided by the Knafitz-developed M-4 high-latitude, low-drift, post-rotation gyro which is standard on many USAF aircraft.

M-H has not switched to magnetic amplifiers as have some other autopilot manufacturers. The reason, according to Ben Glaz, E-10 project engineer, is that the magnetic amplifiers required by vacuum used with magnetic amplifiers. The E-10 is designed for operation in 200° ambient in a figure which M-H hopes is safe to



FIRST OPERATIONAL USE of E-10 automatic flight control system will be on a late model of North American Aviation's supersonic F-108 Super Sabre fighter.



E-10'S NERVE CENTER is complex/robust whose design stresses easy maintenance.

225°) affecting the high temperatures found in high-speed jets.

• **Operational Features**-Some of the E-10's operational features, appearing for the first time in M-H equipment, confirm certain design trends which first appeared in the Westinghouse W-3A autopilot, designed for the F-94C interceptor. Orders are believed new to the industry. Here are some of the E-10's operational highlights.

• **All-attitude maneuverability**-Although rate gyros have been used in one or

more cases of previous M-H autopilots to provide rate-of-displacement signals, the E-10 uses the non-mechanical device as a primary reference. This gives it an isolated maneuverability about all three axes, an important feature for fighters and interceptors. For the pitch axis the rate gyro signal is supplemented to provide ship-to-ship displacement signal.

• **Roll-in dampers**-The E-10 provides stability augmentation for roll, yaw, or three axes, as required. The yaw axis system provides damping in straight



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• **Progressive**—Loud's modern manufacturing facilities are constantly being expanded to meet the

increased aircraft demands for quality and economy. This has resulted in the ability to produce precision machined products of the highest quality at a lower price than can be produced by the customer themselves.

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• **Engineering and design development** by Haskel Engineering Associates, Glendale, California

• **National Sales and Service** by Haskel-Loud Aircraft Service Corp., Glendale, California

• **Resident Sales Engineers** located in Seattle, Wash.; Kansas City (Independence), Mo.; Baltimore, Md.

81 W. LOUD MACHINE WORKS, INC., 540 E. 1st Street, Dept. 10, Pomona, California

flight and turn, yet does not oppose rotation of the nose (in fact does neither direction).

• **Control stick maneuvering**—Roll maneuver, under manual or autoflight control, as introduced in the same way as the regular control stick, (for column) and rudder pedals. This also initiates the hinged maneuver stick or load controller, allows a position to leave in the traveled potential.

• **Constant Mach No. display**—For optimum fuel economy during cruise, the pilot's climb to cruising altitude, the E-10 can establish a rate of climb which keeps the plane at a constant Mach number.

• **Choice of attitudes**—MH has designed both parallel and differential types of electrically controlled hydraulic servo actuators for the E-10. The former, which can be used in the main control surface actuator, is a high speed unit connected as possible with the plane's control linkage. The latter, a lower power device connected in series with the control linkage, actuates the plane's lower valve which then operates the boost actuator driving the control surface. This choice of attitude type depends upon the individual airplane installation. The E-10 will use both types.

• **Tail Walk**—The E-10 has not needed a complex bank down post autopilot design philosophy and practices. For instance, the E-10 uses a dual speed system and potentiometer and offset of air and reason used by many others. The system, according to Carol, is first in d.t. system permits multiple signals to be added without adding problems, without the use of small, lightweight dual rate deviation and integrative, instead of requiring small integrating motor and



6-10 CONTROLLER actuator equipped attitude within 50 ft, above 30,000 ft.



DOUBLE DUTY STICK is used for both manual and remote control maneuvering.

has control remotely maintain cruising speed within 10 Mach.

• **Constant altitude**, for cruise, MH system maintains capped altitude within 10 feet below 15,000, within 50 feet above this altitude.

• **Unaided maneuvering**, by human pilot or when tied into emergency fire control.

Although the E-10 carries a conventional attitude gyro for roll-out use, MH prefers to use a pseudo displacement signal (integrated rate signal) for pitch attitude control. This means it actually selected pitch maneuvering and amplifier synchronization problem. Another advantage is that a pseudo logarithmic pitch channel (the long-term phase) oscillates frequently encountered in the highest aircraft which use displacement gains for pitch attitude reference, MH says.

If the E-10 is in the maneuvering mode when engaged, it monitors the driving pitch attitude, with a rate of approximately 0.3 degrees/sec. MH reports. If the plane's bank angle at the

time of engagement is more than five degrees, the E-10 continues the existing rate of turn, if less than five degrees, it levels out and holds heading.

• **"Key loc"**—Maneuvering—Control stick maneuvering, which MH approved, first year ago under the name of "Key loc" may not at first appear useful on the E-10, although other autopilot manufacturers (including Lear and General Electric) are planning to incorporate it in their new systems.

MH says it considered an alternate type of control stick maneuvering before settling on its present approach in which impulse pitch and roll are proportional to the force which the pilot applies to his control stick. This low deflection a stress element built into the top portion of the stick (which MH called "key loc") which operates a potentiometer a maneuvering signal.

With the system selected, control stick force gradients can be made identical to those experienced in manual flight to the pilot. "In fact," the same to the pilot whether maneuvered under manual or autoflight control. To save this even further, MH incorporates a motor-driven integrator (which doubles as a roll rate transducer before engagement) that serves to hold the plane in a bank when the pilot takes his hands off the control stick, in order to avoid flight conditions.

• **A Look at Major Components**—Some of the principal E-10 components with new design and construction features, include:

• **Amplifier-calculator**—E-10 uses one unit. It contains the three main servo amplifiers plus four summing and control amplifiers, is designed for speedy maintenance and optimum heat dissipation.

Each of the seven amplifiers is built on a small plate in aluminum shield with heat resisting base. These amplifiers are clustered around three large phase-shifting units (one for each coil) which are in turn specially removable from the main amplifier-calculator chassis containing power supply and associated control relays. The seven amplifiers are identical and interchangeable. When replacement amplifiers are required, they are achieved by using different values of feedback resistors located in the same chassis rack.

• **Pitch/roll servo actuators**, together with the polarized torque motor control valve (which controls flow to the actuator piston in accordance with servo amplifier signal), is built into a single integrated package which also contains manual manual control and selective devices. For instance, the package contains a solenoid-operated engaging valve which automatically disengages the autopilot in the event of failure of hydraulic or electric power, giving the

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The hydraulic package also contains a small beam actuator which functions to prevent rotolag engagement if there is a large unbalance in the control valve which would produce a sharp moment movement of the control surface actuator. The same device also operates switches to rotate the plane's trim or take servo motor (if so equipped), continuously keeping the airplane in trim. Relief valves, whose pressure settings can be adjusted, are provided to limit maximum output forces of the main actuator piston and protect the human pilot to overpower the actuator in an emergency.

The torque-motor control valve employs a twin-piston, balanced torquing construction. In its internal hydraulic packing is the main actuator piston which functions as a actuating valve instead of employing the same conventional symmetrical design which is more difficult to machine and assemble.

The parallel-servo package weighs approximately 5 lb., operates at hydraulic pressures of 1,500 to 3,000 psi over a temperature range of -50° to 200°. Frequency response of the unit is around 10 cps. for 90-deg. phase lag, depending upon load and operating conditions. MHI reports

• Differential-type servo actuator consists of a smaller, lower-power control valve and actuator. These are no engaging in overpower valves, or trim actuator since they are not required in a differential-type sticking. However, the differential servo does incorporate provisions for automatically locking the actuator piston, and centering it if desired, when hydraulic power is restored. The unit weighs approximately 1 lb., has a 90-deg. phase lag at 40 cps, MHI says.

• Airbleed and Mach sensor coupler bellows channels which are continuously lubricated by a small servo motor for maximum sensitivity. The motor drives a notched tach generator to provide both displacement and rate-of-change signals. MHI says this airbleed sensor can detect a one-foot change in altitude at sea level, its Mach sensor can detect a change of 0.081 Mach number over its operating range.

The vertical non-flanking gyro and rate gyro used in the F-10 were an innovation and described previously in AVIATION WEEK (Feb. 2, 1953, p. 18, Feb. 1, 1954, p. 45). MHI's policy is to market individual new components, such as gyros, developed for its automatic control systems.

The E-18, like other recent aircraft control systems, can be provided with an automatic gain changer to vary system characteristics as a function of air plane speed, and with safety motion or G-limits.

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1944	2"	2 oz.	\$15.00
1948	1 1/2"	1 1/2 oz.	\$12.00
Control	0"	0 oz.	0
Control	1 1/2"	1 1/2 oz.	7

LOOK TO CPPE FOR SYNCHRO PROGRESS





FIFTH ANNUAL FORUM sponsored by PWFA and Airmob talked about engines and



R2000s DC-3 modification of Douglas transport, which mounts R2000 propellers

Airmob-P&W Forum Rears Bow...

R2000s Give DC-3 34-Mph. Boost

By George L. Christian

Midvale, N. J.-A strong pitch for the 18-Fer DC-3-to DC-1 conversion came from Pratt & Whitney Aircraft at the fifth annual Engines Operations and Maintenance Forum sponsored here by Airmob and PWFA. The one-day forum was attended by ILS experts representing 59 companies, U.S. and foreign government agencies, and the military.

■ **18-Fer DC-3**-The 18-Fer DC-3 shows a 14-mph speed edge over the standard DC-3. It is one of several successful methods of upgrading the old northern. Powered by T-28s, with Pratt & Whitney's assistance, it is the method recommended by the engine

manufacturer to operators during its boost DC-3 performance.

PWFA's opinion is that the "Super 92" conversion package underwent from that enjoyed at last year's forum. Super-92 refers to DC-3s whose R1130-02 engine cylinders have been replaced with R1130-72 cylinders. Some believe that because of the better cooling characteristics of the -72 cylinders, more power may be safely pulled on the engine, but PWFA says it cannot go along with that.

Pratt & Whitney spokesman, addressing themselves to operators of existing DC-3s, said: "Rather than go to the -75 or -65 versions of the R1130, let's look at the R2000." Here is what a first look shows:

A full 100 hp more per cylinder is available at cruise with R2000 engines cranking power is rated at 740 hp, only the R1130-72 will deliver 650 hp, and the R1130-02 will just eat 400 hp at cruise.

For American World Airways and Foreign quote these comparative speeds of the aircraft:

- **Standard DC-3** powered with R1130-02 engine cruising at 600 ktp, altitude of 1,000 ft, cruise TAS: 163 mph.
- **18-Fer DC-3** with R-1000s pulling 720 hp at the same altitude, cruise TAS: 214 mph.

Takeoff and climb power for the R2000 was listed as 1,450 hp and 1,150 hp, respectively, compared with 1,200 hp and 1,070 hp for the R1130 series engines.

- **Power Package**-Here are the details of a 18-Fer DC-3 power package:

- **Engine**, PWFA R2000-DS rated at 1,450 hp, for takeoff, 1,100 hp (cruise rated) and 750 hp maximum cruise power.

- **Propeller**, Hamilton Standard Hydro-matic with R1050 hub and 685M-1 blades. (This is a 3-bladed prop which, with the R2000 engine, weighs slightly less than the R1130 does with the old prop.)

- **Cooling**, Exhaust cooling is standard DC-3. Auxiliary cooling is new and fabricated of stainless steel.

- **Exhaust**, A new lightweight, cast-aluminum exhaust collector is used with the new power package.

The Oiler. A new 11-in. diameter oil cooler is used. Insulators include provisions to eliminate those propellers through the cooler in case of fire in Engine Zone One.

- **Cowl flaps**, New cowl flaps are provided which reduce maintenance difficulties, provide smoother air cooling surface and hold them sitting more easily than standard DC-3 cowl flaps.

- **Air pump**, Reinforced air pump provides better run-in recovery and higher critical power altitude for the R2000 engine.

- **Fire detection**, A Zone One fire detection circuit has been added to give protection in that zone in addition to the existing Zone Two detector installation. A fire detection test switch has been installed and a second CIO, bottle added.

The 18-Fer DC-3 has a grossed rubber over tub to lower podal forces in case of engine failure at takeoff. It has an allowable takeoff and landing weight of 26,000 lb.

PWFA pointed out that the R2000 powerplant is a direct predecessor, as are spare parts, and a wealth of operating experience has been accumulated on the engine in DC-4 operation.

At present there are a few DC-3s converted to the 18-Fer configuration. Further information on the article.

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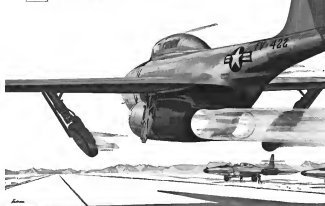
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tion may be obtained from PanAm to Panama, Miami International Airport, Miami.

► **Forum Highlights-Hive** is a summary of some of the other highlights of the forum.

► **Maintenance and bearings.** Some time ago, Northwest Airlines experienced a rash of engine and bearing failures on 747s attributed to its test of DC-3.

Trumble was troubled by the fact that the "plum" oil tanks had happened to stall in there. Ranch was then tested oil returned from engine to happen and was immediately directed back to the engine before being sufficiently degraded. NWA quickly worked out a fix consisting of removing the boppers and installing de-aerating baffles in the oil tank. No further failures were reported.

► **Cowl flaps.** PW/A is not in favor of the practice adopted by some airlines who replace movable cowl flaps with fixed gills to simplify the installation and reduce maintenance. PW/A feels that considerable work time is necessary to keep engine operating time positions within specified limits.

► **Oil dilution.** PW/A spokesman had this advice concerning oil dilution: First, always consult a manual which has your particular plane's recommended configuration listed to determine duration of dilution as relation is reported for temperatures for the period the plane will be idle. If the engine to be diluted has several hundred hours on



Hot Lunch Coming Up

As those business and pilot crews as to loaded another long time before with one answer when they get hungry—the hot lunch. But now the Nutrition Section of the Research and Development Command's Aeromedical Laboratory has worked out a way to use lightweight heavy chowmen and pack materials for individual packaging of the meat, vegetables, rolls, and other makings of the lunch. This chowman packages are refrigerated until needed, then thawed in an electric stove for 30 minutes each day. These hot lunches are said to be cheaper to make up than hot food.



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it, it is wise to check the oil sooner after startup, because idling tends to loosen sludge which may settle away when the engine is running.

Before taking off, be sure to hold off all the fuel in the oil. If fuel is left in the oil it will tend to run rapidly when lifting very hot engine parts during takeoff and blow out of the engine's bearings.

Engine hydrolocking. A hydrolocked engine is one in which oil has seeped past the rings of the bottom cylinder while the engine is idle and has now seeped sufficiently in the bottom cylinder to force the piston to "beat time" on the oil during the compression stroke. If this happens and the engine is being cranked through with considerable force, damage will usually result.

If hydrolock is present and a direct drive starter is installed on the engine, no damage will result as it attempts to start the engine because the stall torque value of the starter is too low to turn the engine against the hydrolock. This is true even if the starter clutch is stuck.

If an inertia starter is installed on the engine, damage can be done as trying to start a hydrolocked engine. If such a start is attempted, check leak rate of the cylinder with a straw or pipe. If leak, change the engine, if straight, engine is OK, provided cylinder head-down study are tight.

A good check for hydrolocking on an EC180 is to turn the engine through about 12-15 blades before starting. This also serves as a good pre-icing operation.

Field burner check. To determine whether or not an engine is developing full power, regardless of the field's altitude (assuming that the engine has no RPMF gaps or other instrument to show power output), FA/W suggests the following procedure: Detach some field pressure of the engine prior to starting. After engine has warmed up, crutchhold pressure should steady down at approximately the same reading with the engine running over at 2,800 rpm. If run is 50 less than the 2,600, there probably is trouble and further checks should be made. This check will locate a trouble such as fuel plug in one cylinder being out. A magneto check will not locate such a malfunction.

Engine baffles. FA/WA stressed the importance of checking the condition of engine baffles to keep engine heat absorbed as efficiently as possible. One airline that made a survey of its engine baffles, replacing or replacing damaged ones, found that engine cylinder head temperatures dropped 10-15 degrees. This meant that cool fans could be closed to half the previous settings, increasing the aircraft's speed as much as four knots. A CH addendum FA/WA reported its

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SOME STRAIGHT TALK TO ELECTRONIC ENGINEERS



William M. Wood, Jr.
Vice Pres. - Engineering

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objection to use of oil additives to improve engine life, etc. A spokesman said: "Ford & Wharton engines are designed to operate on standard oil as diluted by 'vacuum jans'. . . . We have investigated many 'vacuum jans' throughout the years and they just don't do what their promoters say they will. . . . F&W's tests all supported oil used in our engines. . . . We are not opposed to oil additives because we cannot control its concentration when used in the field."

◆ **Shop Tour—**As walk through Aircraft's engine overhaul and production shops at Millville indicates the international nature of the company's clientele. Some customers: Trans-World Airlines, Ethiopian Airlines, Civil Air Transport (Taiwan), and airlines in Greece, Italy, India, Venezuela and Argentina, among others.

Aircraft recently installed a hard chrome plating for crankshaft pins and prop shafts. The company says the same machines about \$500 (on R2610s and R2080s) every time a serviceable part is replaced rather than replaced.

OFF THE LINE

Five types of military transport aircraft now are undergoing overhaul or modification at Texaco's Greenville, Tex., plant, with the arrival of the first of 27 Air Force C-46s. Texaco will inspect the planes and perform necessary repairs and maintenance. Contract is expected to run through August 1955.

Pneumatic pressure regulator valve gets "laid" into power boost rudder control system of Canover F-102. Developed by Air Associates, the valve is 8 in. in diameter, 7 in. long, and is said to be considerably lighter than similar equipment. It operates from a pilot valve, which senses the aircraft's speed and adjusts the load on the rudder controls in direct proportion to the plane's velocity.

Two-and-one-half-million-dollar Air Force contract for overhaul of R2610-29A engines has been awarded to Aero Jet, Inc., Miami. The new contract is expected to provide work for 450 employees through September 1955.

Much power in a small package: a spokesman for a large engine manufacturer recently unveiled the giant strides being made in the country to produce turboprop engines of enormous power by citing this company: to power the naval buoy in land light, today's lightest and most powerful propeller power of a B 35, all packed into a single powerplant (and twin engine configurations are coming along).

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mainstream load-carrying capacity requires rugged performance of its landing gear. *Powering over rough terrain* like this improvement of existing gear materials is one of the reasons why leading aircraft designers constantly look to Menasco Manufacturing Company for advanced ideas, originality of design and progressive techniques in the production of better landing gear.

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Higher Airline Profits, Mergers Urged

Major policy statements of vital concern to the airline industry were presented last week by Oswald Ryan, a Republican member of Civil Aeronautics Board and former CAB chairman, and C. R. Smith, president of American Airlines.

Ryan stressed the need for profits to finance equipment conversion. Smith criticized CAB's subsidy policy.

Smith Says

Sharp criticism of the Civil Aeronautics Board's subsidy policy and support for the Air Carrier Contracting Cooperative Air Policy Report were expressed by American Airlines' Smith in a speech to the National Defense Transportation Assn. in Pittsburgh.

Smith's views on an effective national air policy included the following paragraphs:

- **Trunklines.** Merge of all U.S. trunk-line routes and services into logical operating systems that can be operated without government subsidy.
- **Overseas airlines.** Eliminate restricted competition by U.S. flag lines in some national operations by assigning single carriers sole operational rights over specific overseas routes.
- **Local service airlines.** End federalism in finding methods that will decrease their dependency on government subsidy and continue their operations as an integral part of U.S. air transportation.

• **Military air transport.** Replace class of transports now being operated by the military with military equipment and give more attention to air transport as the military program.

Smith said most of the airline industry believes trunkline service could be merged into efficient systems. "It is not being done," he said, "for the reason that CAB seems inclined to guarantee the continued existence and advocacy of individual corporate carriers."

Smith's policy stresses the use of economic justification for merger.

- **Growing tendency.** He noted that Section 406.8 of the Civil Aeronautics Act provides for industry payment only when the service required is in the national interest at the time payments are made.

"There seems to be a growing tendency in the government to apply that provision as though it and a subsidy should be paid to any needy carrier that holds a certificate of convenience and exclusivity..." AA's president said.

"Such an application would ignore the most important part of the statute and attribute an absurd intention to Congress."

"Certainly Congress never intended that airline management was to have its

Ryan Says

Ryan advocated bigger public outlays to enable U.S. airlines to finance a \$1-billion conversion from piston to turbo-powered transports without taking back the government's subsidy.

When Capital Airlines inaugurates service with turbojet Victorias Van Nuys next year, Ryan told the St. Louis Chapter of the National Aeronautics Assn., "this airline will enter into being a new age in air transportation in the United States, an age in which it will be substituted for piston propulsion."

• **Depreciated costs.** "It is entirely possible that over the next 30 years, or even so less time, as the new transport industry will be faced with a capital outlay for as much as \$1 billion for new equipment," Ryan said. "That

amount is the equivalent of the total capital investment of the industry at the present time."

"When you consider that at the same time the industry is struggling with these enormous problems of the transition from piston to jet it will also be engaged in the task of completing its transition from a subsidized to a self-supporting industry and of preserving its economic self-sufficiency against further invasion by government aid, you are forced to the conclusion that the financial demands upon the industry will be sufficient period..."

He called for reorganization of CAB and the industry. "The regulatory agency would have to be prepared to permit an association of move savings in the prosperous years, and the monies would have the opportunity to use such reserve earnings to supplement the deficient earnings in the bad years."

• **New Board Formula.** Ryan said the Board should develop its present policy of giving profit to capital investment, low or no transportation, in fixing air line rates. Instead, Ryan suggested, (Continued on page 34)

makers underwritten by the taxpayer that of the positive showing of billions of dollars in losses, which are almost difficult to prove.

"Under the law as written by Congress, it thus may possible justification for subsidizing individual corporations in the airline industry if the total of trunkline routes and services can be operated with profit and without subsidy if properly arranged into logical systems be merged."

• **Laid to rest.** Smith said he had as support in the AGC's national air policy report for a reversal of the "Chicago instruction" philosophy of various situations.

"The effect of reaction is 'closed in situation' was laid to rest by Congress and the federal government many years ago and I believe it impossible to reverse."

He criticized the AGC report on international operations on the grounds of expenses in spelling out an alternative system to the present international competition among U.S. flag carriers in overseas routes.

"The AGC should finish its job by seeing specifically what it is for and what it is against in the experience of overseas air routes for the United States."

• **Tailoring.** Ryan said that the U.S. airline transport fleet would have 150 planes by the end of 1970, including 620 low-engine transports, Smith criticized the low program in the development of tailoring powerplants and military transports.

"There is a great deal of more efficient powerplants for low-engine transports has been disappointing," he said. "We very much need a high-efficiency tailoring powerplant of modern design and production."

"The military transport types that have been developed have not been impressive..." Too high a proportion of the military transport fleet is still of obsolete design.

• **Little Support.** Smith challenged the AGC report on local service airlines and said its recommendations would find little support in communities served by these carriers.

He said the federal should not be subsidized and operated by trunklines but continued under independent management.

Smith said the local service airlines would continue to require government subsidy but that the size of the support could be reduced substantially as the future and the stronger local carriers eventually could become self-sufficient.

(Continued from page 88)
profits should be determined by offer of these two methods:

- **Relate profits to gross revenue**, a criteria advocated by Capt. Eddie Rothblum, board chairman of Eastern Air Lines, and other industry spokesmen.
- **Relate profits to both gross revenue and investment**, offering compensation for "risk," for use of capital and for the creation of new equity.
- **Understand Confidence**—After adopting the latter standard as one used not only in 1947, but explained, CAA admitted to its policy of allowing a "qualified" investment environment. "After the domestic industry was then subordinated and deficiencies in earnings resulting from the thin profit margin could be remedied by selective allocations."

"But now we are confronted with a domestic transoceanic industry suddenly free from restraints, and that same thin profit margin is being used to call for a rate structure better adapted to meet these changed conditions."

He added: "We know from experience that the profit margin in this air transport industry is as small as in other industries. In the latter cases, that is undesirable since it can and does cause losses and the dissipation of the industry investment and that this weakens the confidence of the investing public in this industry. It seems desirable, therefore, that the transoceanic air industry should be determined in the light of the industry's economic characteristics and of the industry's experience."

"Whatever method the Civil Aeronautics Board may ultimately adopt for the airline industry, it should be one which will provide a profit that will be fair and reasonable."

- **Major Boon**—The acceleration of the world under this year's new law would be a major boon to airlines as well as to their passengers, with one Ryan and in a later speech to the Savannah Rotary Club.

He observed: "The five hundred of an carrier during the first three years of capitalism represented the first step in decreasing the first three years of operation of the newly organized line as an amount as great as \$100 million."

New ACTA Officers

Aerowest Transport Ann has selected J. B. Johnson of Washington, D. C., as president and named two new members to the national airline captain's board of directors.

New board members: Irving E. Himmelfarb, Coast Airlines, Burbank, Calif.; and Ken Kerkorian, Los Angeles Air Service, Hawthorne, Calif.
Members re-elected to the board: Ray C. Banta, San Carlos, S. D.; James C. L. Moore and J. B. Johnson.

Other officers elected by the board: A. J. Norris, vice president and general manager; Robert C. Jones, vice president and general manager; George N. Adair, treasurer; and Kenneth K. Hart, director of public relations and airfare promotion.

Airwork Sets First Atlantic Cargo Flight

Aerowest Airlines, recently formed by merger of Aerowest, Ltd., has set Mar. 1 for start of trans-Atlantic cargo flights. John E. McMillan, president of the British airline, new division and former president of the American World Airways, says two flights weekly, in each direction, are planned. Douglas Skyways will be used initially, with three DC-6A's later in the early 1958.

The flights will originate from Miami, Frankfurt, Zurich, London and Frankfurt to Gander, Montreal and New York. International Air Transport from now will be an effort, since the company recently became a member of that organization.

Airlines May Join New AF Turboprop Tests

U. S. airlines have been invited to participate in a special turboprop investigation by the Federal Aviation Administration. The test program will be run by the U. S. Army Air Force Military Air Transport Service squadron.

A meeting was scheduled last week at the Pentagon between representatives of 12 airlines and Air Force research and development officials.

"We will hold three explanatory talks with the airlines to determine the extent they wish to participate in the program," said an Air Force official last week. "We will discuss all phases of the tests ranging from test objectives to the feasibility of the airlines flying one turboprop or two."

- **Modified Airlines**—The USAF turboprop service test program has been pushed by Roger Lewis, Assistant Air Force Secretary for Material, to gas turbine operation experience for this type of equipment. Airlines to be engaged are: • **Two Convair 440's**, equipped with two, 1350-hp Allison YT36 engines, and Aeromarine propellers.
- **Two Boeing 707's**, powered by four 3500-hp Pratt & Whitney Aircraft YT14's that drive Convair-Wright propellers.

- **Two Lockheed 421B's**, using four PW5A YT14's with Hamilton-Standard propellers.
- **All aircraft are standard airplanes, modified to take turboprops.**
- **Continental Test Roster**—The new program will be based on Kelly Air Force, under MATS' Continental Division. The aircraft will be used to carry domestic cargo operations, emergency equipment to installations within the U. S. and to Alaska.

"Minors of the new squadron," says MATS, "will be to test the new type turboprops to verify service specifications, accumulating engine flying hours to aid in the development of the turboprop program."

Personnel from MATS will be trained in engine and aircraft features and at Edwards AFB, Calif., prior to squadron assignment.

CAA Airport Official Under Investigation

Commerce Department is investigating allegations that Philip Moore, former chief of Civil Aeronautics Administration's Office of Air Traffic Management, had been in contact with CAA Administrator, accepted payments from the Dade County (Fla.) Port Authority.

The allegations grew out of a federal grand jury investigation in Miami. • **Funda Roster**—Moore was placed on annual leave Sept. 25 and relieved of his duties as District Airport Engineer for CAA. The Commerce Department refuses to reveal the results of the investigation.

Involved in the investigation are funds granted to Miami International Airport, controlled by the Dade County Port Authority.

CAA says Moore had received \$4,325,388 as federal airport aid. The airport is scheduled to receive \$300,000 from fiscal 1955 funds. • **Port Authority**—Moore's position was "It is routinely a tough break for us. Miami International probably would have received its grant in any case because of the large amount of traffic from the 1152 radial operations."

"CAA has loaned about \$200 million to airport grants since the program started in 1947 without any bad apples. It is the first case of any irregularity in our grant program."

Moore was appointed director of the Office of Airports in 1948 after 15 years in the field of airport design and construction. He remained in director until 1954 when he was transferred to Miami as a district engineer.

Commerce and CAA officials are uncertain about the extent of action that will be taken as the result of the allegations so far.

Air Fare Outlook: Stable for 1955

European airlines plan boosts to meet higher costs; other areas generally will hold or even cut prices.

By Frank Shaw, Jr.

Airfare program for 1955, the next year, will remain stable as most parts of the world, according to forecasts made at the International Air Transport Assn's recent traffic conference in Venice.

Only major changes will be within Europe, where a wide range of adjustments is planned to meet rising operating costs and to meet the demand for the new aircraft between countries that have become stronger in mid-term Scandinavian points.

These adjustments will involve increases of 25% to 50%, it was decided. On the reduction side, there will be a 5% decrease in fares to other points, along with a slight drop in special tourist fares between Britain and the Scandinavian countries.

Delights also set as a new European line based in London will open service in off-season and night flights to assure that "reverse traffic and do not dilute normal revenues."

• **Am Airlines**—Other fare structure changes were set during the meeting. • **Western Hemisphere**—Within the Americas, rates will be maintained at their present level, with a few minor adjustments. • **Asia**—Rates will be set at 75% to 85% on a per cent basis in Central America between Mexico City and Panama, as well as several new routes north within the Caribbean area.

• **Europe/Middle East/Asia**—Fares are expected to remain generally the same, except for increases up to 15% between Western points and India, and between Europe and Madagascar. The latter will apply chiefly to first-class services.

In addition, there will be some cuts in fares between the various Mediterranean and the Middle East.

• **For East**—The rate structure will change somewhat, with new roundtrip economies from about 12-15% below present fares, about 10-15% below within the U. S. also will be set. Some of the rate changes will be in the form of a new tariff of holding time requirements, designed to set up a point-to-point of airfare technology and increased capacity to study the problem in action in all current use, with a view toward its possible adoption by the conference as an absolute rate cut year.

Some alterations were made in the rates for seasonal operations in order to reduce the subsidies that would be paid to airlines for seasonal operations.

with flights to single and responses, at the same time, however, new and similar benefits and giving certain the necessary flexibility to express new seasonal characteristics within the limits of current norms.

• **Indian Rates**—For the expanded part of meeting that worldwide trends were "efficient and economical," as well as to provide the attention of seasonal operations, the conference delegates held end up with an agreement to discuss provisions, among them, the so-called "open air" rate whereby roundtrip reductions are given for passengers that begin and end in early cities, rather than in the same city.

Facing provisions for seasonal discounts, set when only first-class service was available as the means of service, it was decided to set the light of the year of service and 10-15% increase through out the world.

Delegates and their services now go a long way toward providing substantial benefits, and within the same limits for students, business, and other and which should be agreed that discounts should be reduced from 10% to 25% in most cases.

• **Widespread**—On the other hand, across the North Atlantic, it was decided to defer for this time being any agreement in order to have more time to reconcile "wide differences of opinion" as to the best way to express the volume of night flights between Europe and North and South America.

Michel de Villeneuve, vice president of Air France and chairman of the task force, said that the agreement between the 15 airlines, finally reached, was "clear" as the Airlines also had been agreed upon before the meeting.

The airline delegates also decided to set up a new committee to study the effects of changes in fares on the cost of living and on the cost of travel.

New year's traffic conference session will be held somewhere in the future, with a view to the next year's general meeting, also to be held in this country.

SAWA Boosts Payload On Super Connies

Seibach & Western Airlines' new Super Conquistadors are equipped to carry more passengers than any other version of the Super Connie.

Seibach's planes accommodate 93 men-91 for passengers, but for new airlines, Eastern Air Lines' Super Conquistadors carry 95.

Other SAWA plane equipment includes a galley and more from a type recorder. An SAWA spokesman says: "The airline is now really getting the value for its investment in carrying our Super Conquistadors to transport their passengers."

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- Nov. 4-5—Aerospace Education Society, 1st Western Forum, Institute of the Aeronautical Sciences Building, Los Angeles.
- Nov. 4-5—Aerospace and Transport Engineering, East Coast conference, Sheraton Sheraton Hotel, Atlantic City.
- Nov. 4-5—National Aircraft Trade Assn., annual convention and meeting, Sheraton-Torrey Hotel, Miami Beach, Fla.
- Nov. 4-5—National Aircraft Trade Assn., annual convention and meeting, Sheraton-Torrey Hotel, Miami Beach, Fla.
- Nov. 5-10—Air Industry & Transport Assn. of Canada, annual meeting, Clarendon House, Quebec City.
- Nov. 5-12—Air Line Pilot Assn., convention, Statton Hotel, Chicago.
- Nov. 10-12—Industrial Management Society, 19th National Time and Motion Study and Management Clinic, Hotel Sherman, Chicago.
- Nov. 11-12—Annual Meeting, defense industry, Hollywood Roosevelt Hotel, Los Angeles.
- Nov. 12-15—National Symposium on Quality Control and Reliability in Electronics, Sheraton Hotel, New York.
- Nov. 15-17—American Association of Manufacturers Assn., 10th annual meeting, Sheraton Hotel, Washington, D. C.
- Nov. 15-17—Marine Assn., 10th annual meeting, Sheraton Hotel, San Francisco.
- Nov. 17-19—California Association of Aeronautical Engineers, annual meeting, Sheraton Hotel, San Jose, Calif.
- Nov. 18—Professional Society for Quality Control, 10th annual meeting, Sheraton Hotel, Dallas.
- Nov. 19-Dec. 1—American Society of Mechanical Engineers, Aviation Division, annual meeting, New York.
- Nov. 19-Dec. 1—Aerospace Research Society, annual meeting, Hotel Manhattan, New York.
- Dec. 17-19—Flight Test Society, Sheraton Hotel, Washington, D. C.
- Dec. 17-19—Institute of the Aeronautical Sciences, 10th Wright Brothers Lecture, 11 S. Chamber of Commerce Building, Washington, D. C., to be repeated Dec. 18 in Los Angeles and Dec. 21 in Cleveland. Lectures: 1st Landing, director of the Aeronautical Research Institute of Seattle.
- Jan. 19-24—World Trade Fair of Aviation, Mass. International Airport, Miami, Fla.
- Jan. 24-27—First International & Engineering Show and Trade Show, sponsored by Clapp & Polak, International Association, Chicago.
- Jan. 24-25—Institute of the Aeronautical Sciences, 21st annual meeting and 10th Wright Brothers Lecture, Sheraton Hotel, New York.
- Feb. 20-22—Institute of Aeronautical Sciences, trade show and convention, 2124 AAA Avenue, New York.
- Mar. 25-Apr. 1—North Western Metal Engineers and Congress, San Francisco Auditorium and Ambassador Hotel, Los Angeles.
- Apr. 10-12—Society of Automotive Engineers, Golden Anniversary Aeronautical Meeting, Aeronautical Production Forum and Aircraft Engineering Display, Sheraton Hotel and Sheraton Hotel, New York.
- Apr. 14-15—Aerospace Operations Council, 1955 convention, Olympic Hotel, Seattle.

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A Sound Aircraft Industry

If there is much worry in the aircraft industry about our present military air policy, it is not discernible.

The aircraft manufacturers' own trade organization, the Aircraft Industries Association, is authority for the statement issued a few days ago that the industry today "is better able to fulfill the nation's requirements for military aircraft than at any time since cessation of hostilities in World War II."

AIA says "the industry has been able to bring into production military aircraft of the highest quality, and to give development of revolutionary types upon which our national security will rely in future years."

It also emphasizes that while full strength and efficiency cannot be attained until 1957, our air arm "are equipped today with aircraft of unprecedented high performance," and notes that every combat plane now in production for our Air Force is a jet. All USAF fighter wings already are completely equipped with jet aircraft.

For every jet plane delivered to U. S. military forces each day in 1949, the industry now is delivering five.

AIA concludes that our early estimates of Soviet technological abilities "are undervalued their true capacities," but concludes that we still lead the Russians in aviation.

But we have no time to lose, so AIA undoubtedly agrees, and with the aircraft industry now in its soundest condition in years, it seems to us about time to consider as orderly steps in their strategic research, development and production activities most necessary to increase support and output in the Russian war.

The Sensible Happens!

The official invitation tendered by the Air Force to major U. S. airlines to help it test three manufacturers' six new turbopropeller transports is eminently good sense. It has opened the beginning of a vital new phase of commercial air transportation.

In striking contrast to some rather laugherly attitudes at the put on the part of military people toward the commercial airlines, the meeting called by USAF last week with representatives of 12 airlines to discuss practical means for testing these revolutionary aircraft is a bold and sensible step toward making the most of the taxpayers' expenditures on experimental planes. Technicians and experience in these operations will be shared with industry, rather than hoarded under the old guise of "security."

The Air Force must find all the answers it can to basic questions about turboprop design, operation, maintenance and economics. So must the airlines.

As one hardened observer in civil aviation put it, that military-civil cooperation on new aircraft sounds like one of those projects that couldn't happen in Washington because it makes so much sense!

The airlines have much to learn from the Air Force installation, and the military—see above!—will learn other facts it might otherwise not uncover for many months

without the cooperation of the air carrier.

Those at the Air Force who are responsible for this program—and Assistant Secretary Roger Levine is named among them by *Airweek*—Wash's reportage—owe public commendation for an important idea.

Are Engineers Human?

One of our engineering writing friends exploded a few days ago:

"Do engineers really prefer to read *Scientific* by candle light, just because it is different?" he asked.

"Does the average engineer, trying to keep abreast of new technical developments and ideas in his fast-moving field really enjoy articles meant if they are difficult to read, hard to understand, and filled with differential equations?"

"Or are engineers human? Are they like most people in aviation, long on things to read and do, and short on time?"

We on *Airweek* think engineers are human. We have three full-time engineers—editors—on staff. We have three other aviation publications—so we think we can speak with authority.

Our engineers are always picking out and finding new technical developments of significance in aviation, sorting out the chaff to save engineering readers precious time. We then describe these new technical ideas and developments in stories which are designed for quick and easy reading—usually months before they appear in the learned journals. (And there is a place for those learned journals, in the archives, for original research.)

Some folks apparently think that writing has to be difficult reading to be technical. We don't agree. We think engineers are human.

The Risk of Pioneers

Although Americans take portable pride in thoroughness of our aircraft accident investigations, especially involving airlines, we must note with some of the enormous effort the British have exerted in their post-accident study of the stricken Comet.

Every appropriate square of the British government and industry was called into extraordinary service to trace minutely and with amazing patience and forbearance the baffling cause of the crash.

The Royal Navy's acknowledgment alone, in salvaging 75% of the wreckage of our Comet from the bottom of the ocean, aided by modern television, is a brilliant story in itself.

The accepted theory of metal fatigue poses problems not only for British airlines—some of whom Comet 2 is and is already are built and otherwise modified—but for engineers in the U. S. transportation and industry as well.

The British authorities sternly have blamed new trails in safety investigation and it seems likely that the lesson to be learned, and freely told, will serve aviation everywhere.

—Robert H. Wood

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